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Giant Cervical Kystic Lymphangioma in Children: Surgical Management of a Case

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Abstract

Introduction: Cervical cystic lymphangiomas are rare benign dysembryoplastic tumors of lymphatic origin. Its severity in the child is due on one hand to their fast evolution and the compression of the way aerodigestive and on the other hand, by the classical difficulty of their excision. The purpose of this work was to report a case of giant cervical cystic lymphangioma in a child to discuss the difficulties associated with its management in our context. Observation: This was a 3-year-old female child who was admitted to the ENT department of CHU “Luxembourg” for right lateral cervical swelling. The clinical examination had noted a large anterior-lateral cervical swelling of soft, resilient, painless palpation, movable in relation to the superficial and deep plane, measuring about 20 cm × 17 cm, the skin was healthy. It wasn't particularly to the rest of the physical examination. The diagnosis of giant cervical cystic lymphangioma was discussed. Thorough excision of the swelling by right lateral cervicotomy was performed. The postoperative course was simple and the evolution was favorable. Conclusion: Cervical cystic lymphangiomas are rare. Their management involves surgery, with short and long-term post-operative outcomes are often excellent.

Keywords

Kystic Lymphangioma, Cervical, Child, Bamako
1. Introduction

Kystic lymphangiomas are rare benign dysembryoplastic tumors of lymphatic origin, which represent 2.6% to 5% of congenital cervical masses [1]. They return, with neurofibromas and hemangiomas in the context of hamartomas. They usually occur during childhood with 60% of cases before the first year of life [2] [3]. Of ubiquitous siege, their preferential localization is the posterior cervical triangle, with often mediastinal extension in 10% of cases [3]. The gravity of these tumoral formations in the child is due on one hand to their fast evolution and the compression of the way aerodigestive and on the other hand, by the classical difficulty of their excision [4] [5] [6].

The purpose of this work was to report a case of giant cervical cystic lymphangioma in a child to discuss the difficulties associated with its management in our context.

2. Observation

It was a 3-year-old female child, without particular pathological history, who was admitted on 15 December 2017 into the ENT department of CHU “Luxembourg” for a large anterior swelling. Lero-cervical right. This swelling was observed at the birth of the child and gradually increased in volume. There was no dyspnea, no dysphonia or dysphagia.

At the admission: on the general examination, the child had a good general condition with a Karnofski index at 90%, a temperature at 36.5 °C, a weight at 12 kg. On examination of the neck, he has marked bulky anterolateral-cervical tumefaction right soft, renitent, painless palpation, mobile relative to the superficial and deep, measuring about 20 cm × 17 cm, the skin was healthy looking (Figure 1).

There were no palpable cervicofacial or axillary lymphadenopathies. The rest of the physical exam was peculiar. Thus, the diagnostic hypothesis of a cervical cystic lymphangioma was mentioned. The cervical ultrasound performed showed a mass with multi-partitioned trans-sonic content of about 22 cm in diameter. The result of the cervico-thoracic computed tomography (CT) performed was in favor of a heterodense right anterolateral-cervical mass, a fluid component containing heterogenously enhanced daughter vesicles after injection of the contrast medium (Figure 2).

The cervical structures opposite are pushed back to the outside. The blood work done was without particularities. These elements made it possible to establish an operative indication. The intervention consisted of general anesthesia with orotracheal intubation in a cervicotomy according to Paul André's technique following a careful dissection of a soft rounded mass of fluid content adherent to the sternocleidomastoid muscle (Figure 3).

Ablation of the mass was obtained without nerve or vascular injury. The closure was carried out plan by plan after the installation of a Redon drain. Anatomopathological examination of the operative specimen confirmed the diagnosis...
Figure 1. Child with a large right anterioletterocervical mass of soft consistency.

Figure 2. CT images in axial sections showing a multiple antero-colloro-cervical mass multi compartmentalized, heterodense, fluid content.

Figure 3. Intraoperative mass excision after careful dissection.

of cystic lymphangioma by showing a tumoral pluritissulaire formation with cysts papered by sometimes flattened cells, small strips of keratin of glands and by the foyers of bleeding and of inflammation (Figure 4). The postoperative course was simple and the evolution was favorable. Postoperative controls did not show recurrence one year later (Figure 5).
Figure 4. Histological aspect showing a tumoral training pluritissulaire with cysts papered by sometimes flattened cells, lamellas of keratin of glands and of the homes of bleeding and of inflammation.

Figure 5. Post-operative images of the child one year later.

3. Discussion

Cystic lymphangiomas can be found in all parts of the body except the brain, but they affect most of the cervical area in about 75% of cases. Because of the latency of the disease, the discovery can be done at any age of life. However, children are most affected by cervical localization in about 90% [7]. The predominance of sex varies from one study to another [8] [9].

The symptomatology is a function of the size and topography of the kystic formations. Apart from the palpable cervical mass, cystic lymphangiomas have no clinical specificity. Thus, the circumstance of discovery is sometimes a revealing symptomatology such as the cervical mass as in this observation. Previous locations such as in the case reported are often asymptomatic, in contrast to posterior formations, frequently symptomatic by irritation and compression [10]. Physical signs are lacking or of little value, except in some large tumors well over a hemi-thorax. During the course of the disease, cystic lymphangiomas can become infected, presenting with inflammatory flares or intra-cystic haemorrhage, which is also a source of compression [4].
Medical imaging can evoke the diagnosis. Only histology allows a diagnosis of certainty [1] [2] [4]. Ultrasound shows a hypoechoic or anechoic appearance, sometimes with sediment or fine internal echoes and posterior reinforcement of echoes [10]. The cervical scanner is currently the reference examination, it shows a low density tumor (10 - 36 HU) but the septa are sometimes only revealed after injection of the contrast medium [11]. Magnetic resonance imaging seems to be useful for the exploration of this tumor but would prove to be less efficient than computed tomography especially in case of complications [7].

Therapeutically, many means are proposed such as chemical sclerosis, mediastinal drainage in mediastinal forms, surgery and even radiotherapy [2] [4]. The aim of surgical treatment is to perform complete excision of kystic lymphangiomas. The surgical indication is twofold, either in the case of an acute evolutionary accident resulting in a mediastinal compressive syndrome, or the usual uncertainty of the diagnosis in the asymptomatic patient. The obsession with malignancy, before which some observations have been reported, is a very accessory indication [4]. In the case reported, surgical treatment was indicated to establish the diagnosis of certainty and avoid the occurrence of complications. Given the difficulty of dissection because of the frequent infiltration, visceral adhesions to large vessels of the mediastinum, nerves or even the trachea, complete surgical excision is the only therapy to ensure a definitive cure. The approach is chosen based on localization and kystic extensions. Lateral cervicotomy is recommended by many authors for pure cervical localization. The cervico-mediastinal variety is useful when the seat of the lymphangioma is very anterior to the mediastinal stage [4]. In the case reported, the intervention did not cause any particular technical difficulties; there were no vascular or nervous sacrifices. The success of this intervention would also be explained by the fact that the cystic formation was well circumscribed with a cleavage plan. Sclerotherapy finds its indication at both ends of the natural evolution of kystic lymphangioma. A spontaneous regressive sclerosis is only described for small tumors [4]. This justifies the chemical sclerosis which could slow the evolution in the newborn and avoid a difficult surgical intervention. Some tumors are unresectable because of their size and location with a dangerous anatomical relationship or the general condition of the fragile patient, at high risk of surgery. These unresectable tumors can be treated alternatively by radiotherapy or chemical sclerosis [4].

4. Conclusion

Cervical kystic lymphangiomas are rare. The diagnosis suspected in clinical examination and medical imaging is only confirmed after the anatomopathological examination of the operative specimen. The management involves a fairly often complex surgery that remains effective despite the advent of sclerotherapy. Short- and long-term follow-up is often excellent.

Conflicts of Interest

We, authors of this article declare that there is no conflict of interests.
Consent of the Parental Rights

We obtained the consent of the parents of the child for the publication of the images.

References


A Case of Angioleiomyoma of the Maxillary Sinus

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Abstract

Angioleiomyoma (ALM) is a benign tumor that occurs most frequently in the subcutaneous tissue of the upper and lower extremities. ALM arising in the sinonasal tract is rare, with fewer than 1% of cases presenting in this region. Only two cases localized to the sinuses have been reported to date in the literature. We report a case of a 30-year-old man complaining of a headache noted to have a concomitant lesion in the maxillary sinus. Histopathological examination following surgical resection confirmed a diagnosis of ALM. This report is the first known report of ALM limited to the maxillary sinus, and the first report to present the imaging data in the ALM in the sinus.

Keywords

Angioleiomyoma, Maxillary Sinus

1. Introduction

Angioleiomyoma (ALM; synonyms: angiomyoma, vascular leiomyoma) is a well-differeniated, benign smooth muscle tumor often associated with a vascular component. It occurs in the dermis and subcutaneous tissue of the limbs most frequently, presenting as a painful slowly enlarging nodule in 30 - 50 years old patients [1]. Although the lower limb is the most common site in which ALM is diagnosed, prevalence of the tumor in the head and neck is reported to be between 8.5% - 13%. However, reports of ALM being limited to the sinonasal tract, an uncommon site for parenchymal tumors, is infrequent, with fewer than 1% of cases localized to this region [2] [3]. Further, only two clinical reports of ALM limited to the paranasal sinuses have been published to date [2] [4].

We report a case of a 30-year-old male presenting with headache found to have histopathologically confirmed ALM of the maxillary sinus. We believe this to be the first report of ALM confined to the maxillary sinus.
2. Case Report

A 30-year-old man with no past medical history presented to our neurology department with a 5-year history of headache. He was referred to our clinic following the discovery of a left maxillary sinus mass on magnetic resonance imaging (MRI) of the brain. The patient denied all nasal symptoms including rhinorrhea, nasal obstruction, and postnasal drip. Nasal endoscopy demonstrated edema of the left middle meatal mucosa, but did not reveal the presence of a mass.

T1-weighted (T1WI) MRI showed a lesion in the left maxillary sinus isointense with respect to skeletal muscle. T2-weighted images (T2WI) showed a corresponding heterogeneous, hyperintense lesion relative to muscle (Figure 1).

Paranasal sinus (PNS) computed tomography (CT) showed an expansile, peripherally enhancing lesion occupying the left maxillary sinus. The lesion extended into the middle nasal meatus through the natural ostium. Some calcification of the maxillary sinus antrum was observed without evidence of bony destruction (Figure 2).

Our presumptive pre-operative diagnosis was inverted papilloma, the most common benign neoplasm of the PNS. The patient underwent Caldwell-Luc surgery combined endoscopic sinus surgery under general anesthesia. Intraoperatively, mass was found to be adhered to the uncinate process. The tumor was more adherent to surrounding tissues than typically observed with inverted papilloma. A clearly differentiated origin could not be appreciated. The excised reddish-pink mass measured 3.5 × 3.2 cm. Minimal blood loss occurred during surgery.

Figure 1. Pre-operative brain MRI. (A) T1-weighted image showing the lesion located to the left maxillary sinus is isointense with surrounding muscle tissue; (B) T2-weighted image showing a hyperintense lesion in the left maxillary sinus.

Figure 2. Pre-operative paranasal Sinus CT. (A) Axial view shows an expansile, peripher- al enhancing lesion occupying the left maxillary sinus with bulging into the middle nasal meatus through the natural ostium; (B) Coronal view shows the same lesion.
Histopathological examination of the tissue was performed. Hematoxylin and eosin (H & E) stain of the specimen showed numerous thick and thin-walled vascular structures within the tumor. The vascular wall was composed of poorly-differentiated, spindle-shaped smooth muscle cells with minimal nuclear atypia. The vessels within the tumor were difficult to identify histopathologically due to the flattening of the lumen, and the spindle cells of the vessel wall were less differentiated than the original soft tissue vascular leiomyoma (Figure 3).

Due to difficulty in identifying intratumoral vasculature, we performed immunohistochemical staining for smooth muscle actin (SMA). This allowed us to differentiate ALM with other vascular tumors such as angiofibroma or extrapleural solitary fibrous tumor. The tumor displayed a diffuse, strongly positive response to SMA stain, yielding a final diagnosis of vascular leiomyoma (Figure 4).

Following surgery, the patient experienced complete resolution of symptoms. Twenty-four-month follow up was uncomplicated, without complications or tumor recurrence.

The patient has given his consent for the publication of his case and his images.

**Figure 3.** Hematoxalin and Eosin (H & E) Immunohistochemical Stain. (A) Original magnification ×40; (B) Original magnification ×100. Demonstrated well-demarcated, smooth muscle tissue with intratumoral thick and thin-walled vessels, low cellularity, no mitosis.

**Figure 4.** Smooth Muscle Actin (SMA) Stain. This immunohistochemical stain revealed a positive reaction to the actin filament of smooth muscle fibers.
3. Discussion

The World Health Organization classifies ALM as a type of pericystic (perivas- 
cular) tumor [1]. Previously, it had been regarded as a smooth muscle tumor 
along with deep and genital leiomyoma [5].

ALM is most commonly seen in the lower extremities, particularly amongst 
women between 30 and 50 years of age [2]. There have also been reports of ALM 
presentations in the dermis overlying the neck, ear, external nose, forehead, lips, 
and internal can thus. However, ALM has rarely been implicated in the sinonasal 
tract. In a retrospective review of 21 cases of head and neck ALM, Wang et al. 
reported only two tumors affecting the sinonasal tract [3]. Similarly, of 12 pa-
tients diagnosed with ALM, Yoon et al. reported five neoplasms within the si-
onasal tract [6]. These cases mainly affected the nasal turbinates, septum, and 
vestibule, with only two localized to the paranasal sinuses.

ALM is typically characterized as a slow growing, firm, mobile, and solitary 
subcutaneous mass measuring less than 2 cm. Patients most often complain of 
pain in the extremities. Sinonasal ALM commonly presents with epistaxis and 
nasal obstruction. Less often reported symptomology may include facial pain, 
headache, and epiphora.

Radiologic features of ALM are most effectively viewed using MRI. T1WI 
show isointense signal, while T2WI show mixed areas of hyper and isointensity 
relative to skeletal muscle. Also seen in the T2WI is a hypointense rim 
representing the tumor wall. The hyperintense area shows strong enhancement 
but isointense area by contrast [7].

Of the two reported cases of PNS ALM, neither included clear radiological 
data. One case detailed a 0.2 mm microscopic lesion found in a patient with re-
current sinusitis, rendering the imaging inconsequential. The second case de-
scribed a patient with nasal obstruction and headache resulting from extensive 
masses in the maxillary sinus, sphenoid sinus, and nasal cavity. However, 
Schwartzman and Schwartzman published this report in 1973 without endos-
copic findings or imaging [4]. Our patient presented with a chief complaint of 
headache. In this report, we provide MRI findings similar to those described in 
ALM of the extremities.

Trauma, venous stasis, and hormonal (i.e., estrogenic) changes have been 
proposed to be causative factors of ALM [7]. In the present case, we were unable 
to determine a causative factor; however, the patient may have experienced an 
unreported facial trauma ultimately leading to ALM formation in the maxillary 
sinus.

Histopathologically, ALM is composed of well-differentiated smooth muscle 
cells with intervening vascular channels without mitosis. There are three histo-
logical classifications of ALM, namely the solid, venous, and cavernous types. 
Multiple immunohistochemical stains including, Smooth Muscle Actin (SMA), 
muscle specific actin (MSA), calponin, and h-caldesmon are utilized to differen-
tiate ALM from other neoplasms with a vascular component. Most commonly,
ALM seen in the sinonasal tract is of the solid histological subtype, as was present in our case [2]. Interestingly, the two previously described cases of ALM affecting the sinuses were not of the solid type.

Most ALM shows benign progress with rare malignant change. Only two cases of malignant transformation of ALM have been reported in the extremities [8][9]. Surgical resection is considered to be a curative treatment for ALM [10]. There have been no reported incidences of recurrence following resection of ALM from the sinonasal tract. However, there was a reported case of recurrence of ALM in the oral cavity occurring two months after simple resection of the tumor [11]. Therefore, we believe periodic follow-up after resection is necessary. The patient presented in our study showed no evidence of recurrence in the 2 years following surgical resection.

4. Conclusion

Recently, we experienced a patient with maxillary sinus angioleiomyoma (ALM). ALM is a benign, well-differentiated smooth muscle tumor which can be found at various organs. However, ALM in the sinonasal tract has rarely been reported. The patient’s ALM was successfully resected without complications or recurrence. Significance of the report is that this is the first known report to present ALM limited to the maxillary sinus with imaging data.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References


Parents Perceived Quality of Life for Children with Cochlear Implants

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Abstract

The purpose of the study is to identify the important aspects of quality of life assessed in children with cochlear implant. Parental Perspective questionnaire with modified in Bangla was used as a data collection tool in this study. Data was collected through face to face interview with 25 parents of children with Cochlear Implant (CI) attended at Bangabandhu Sheikh Mujib Medical University, Dhaka. Among 25 cochlear implant children, the boys (12) and girls (13) were nearly the same. Results indicated that the majority of the children had difficulties with communication with known people (48.00%) and before implantation children with CI obtained no benefit at all from hearing aids (76.00%). However, the research finding shows that they are largely satisfied with the outcomes from implantation. Improvement of social relationship, family well-being, within the family, educational condition, and self-reliance was satisfactorily reported by the parents. This study would help the clinician, speech pathologist, children and parents to raise awareness about the impact of CI and its treatment.

Keywords

Quality of Life, Children, Cochlear Implant

1. Introduction

Cochlear Implant (CI) is an electronic device that is implanted into the ear surgically to provide a sense of sound to the deaf or patients who have hearing impairment. Cochlear implantation is to facilitate spoken language development. Therefore, oral/auditory methodologies of language learning are typically recommended for deaf children with cochlear implants [1]. Deaf children do not have the same auditory access as their hearing peers; therefore, their speech and
listening abilities are often limited [2]. In the United States, roughly 38,000 devices have been implanted in children [3]. Many cochlear implant operations have been done to over 150,000 people including both children and adults worldwide [4]. It is noted that 43% of the subjects implanted before the age of 2 and 16% of the subjects implanted before 4 years of age achieved speech and language skills equivalent to their normal hearing peers [5]. Children may learn to use the sensations provided by their implants in different ways, so audimetric measures do not tell us directly about the child’s use of the implant in everyday life; this is why they are often complemented by measures of language development and educational achievement [6]. Parents, educators, family members, and anyone in contact with implant users should understand cochlear implants as much as possible. Children who were identified with hearing loss by 6 months of age and received early intervention had significantly better speech and language outcomes compared to children whose hearing loss was identified after 6 months of age [7]. Children with hearing loss have explained children’s developmental patterns in relation to the various processes associated with language and literacy acquisition (e.g., phonemic awareness, speech perception, fluency, vocabulary, and reading comprehension) in typically developing children [8]. According to Dunn & Munn (2008), hearing loss is the most common congenital birth defect, affecting 2 - 3 newborns out of every 1000 born in the United States [9] [10]. The World Health Organization (1998) defines quality of life as a broad multi-dimensional paradigm that includes subjective evaluations of gratification or satisfaction with one’s life and activities of daily living [11]. This study would be helpful to add knowledge and in making speech and language therapist awareness about the quality of life for parents of children with cochlear implants. Investigator would be professionally taken concerned with the organization for the quality of life for children with cochlear implants. Speech and language therapists can use this information for doing best practice by parents of children communication and concerning functional well-being status of the cochlear implants children.

Description of CI (Cochlear Implant) Device

Cochlear implants are electronic devices which have both surgically implanted and externally worn parts. This is designed to enhance hearing abilities [12]. It consists of a receiver/stimulator that is surgically implanted under the skin, behind the ear with a magnet and an electrode array. It is implanted into the cochlea and provides direct electrical stimulation to the nerve fibers. The external parts include a microphone, a speech processor, and a transmitting coil that are placed behind the ear [6].
2. Methodology

Investigator conducted the study in Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka & data was collected from 29th November 2015 to 25th December 2015. The population of the study was parents of children with cochlear implants. Investigator selected 25 children cochlear implant as a participant to conduct this study. It is a judgmental sampling process where individuals are selected purposely based on the study and investigator selected participants according to the aim and objectives of the study [13]. Data was collected from face to face interview with considering the following inclusion & exclusion criteria.

- Parents of children in both genders aged from 2 to 12 years old.
- Parents of children with the cochlear implant of more than 6 months. Both unilateral and bilateral cochlear implant children.
- Parents of children with CI with other associated disabilities (neurological and behavioral, global development disorder, mild mental impairment, cerebral palsy and diagnosis of meningitis) were excluded.

To assess Quality of Life (QOL), the questionnaire (CCIPP) was used, a specific tool for the pediatric population using CI [14]. The CCIPP consist of 42 general questions divided into seven primary QOL domains: Communication well-being, Social-relationship well-being, Family well-being, General functioning well-being, Self-reliance well-being, Effects of Implantation and education well-being. Parents are asked to tick their responses to the statements on a Likert scale, ranging from strongly agree, agree, neither agree nor disagree, disagree and strongly disagree. Higher scores for the scales and subscales indicate better quality of life [15]. The Investigator used descriptive statistics for data analysis. The percentages of each domain were statistically analyzed using SPSS software. After getting permission from the institute, investigator took an academic permission letter which was approved the principal of BHPI for the study in Bangabandhu Sheikh Mujib Medical University (BSMMU). Permission was also taken from the study in Bangabandhu Sheikh Mujib Medical University (BSMMU) to collect data. After getting permission from the authority of the study at Bangabandhu Sheikh Mujib Medical University (BSMMU), investigator started data collection from the participants.

3. Results

Study revealed that among 25 CI children, boys (12) and girls (13) were almost the same. Most of (44%) the children with CI were 5 - 6 years old. About half of respondents’ (52.0%) professions were house wife. Regarding the educational status of parents, maximum (40%) completed graduate level as shown in Table 1.

Analysis of descriptive statistics and Table 2 shows that mean age in years was 7.2 (±1.52625) followed by mean age at the time of surgery was 3.6360 (±1.07776) and mean time of using CI was 3.5800 (±1.3105).
Table 1. Demographic information of the participants (n = 25).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number (n)</th>
<th>Percent (%)</th>
</tr>
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<tbody>
<tr>
<td>Age of the children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - 6 Years</td>
<td>11</td>
<td>44</td>
</tr>
<tr>
<td>7 - 8 Years</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>9 - 10 Years</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Sex of the children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boy</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>Girl</td>
<td>13</td>
<td>52</td>
</tr>
<tr>
<td>Parents professions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>House wife</td>
<td>13</td>
<td>52.0</td>
</tr>
<tr>
<td>Teacher</td>
<td>4</td>
<td>16.0</td>
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<tr>
<td>Others</td>
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<td>32.0</td>
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<tr>
<td>Educational level of parents</td>
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<tr>
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<tr>
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<tr>
<td>College</td>
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Table 2. Descriptive statistics of children with CI.

<table>
<thead>
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Figure 1 shows that the majority of the participants (48.00%) respond disagree that their children had difficulties with communication with known people. More than half of the participants (64.00%) answered agree that the quality of their child’s speech gives them a cause for concern. About 44.00% participants was neither agreed nor disagree can on the point of chatting without seeing the face. Most of the parents (40.00%) had agreed that they can communicate with children by speaking. Majority of the parents of children with CI (56.00%) answered agreed on developing their child’s spoken language. Maximum child was reported with neither agreed and disagreed by their parents and they had talked and engaged others in conversation.

Figure 2 revealed that about two third of (76%) responded strongly agreed that before implantation child obtained no benefit at all from hearing aids. More than half of (68.00%) parents had strongly agreed that the children were totally reliant on implant all the time. About 48.00% participants agreed that their children knew when s/he (children) wanted to get their attention and another
48.00% participants were neither agree nor disagree about this issue. 48.00% participants responded that their children could amuse themselves by listening to music or watching TV or playing games. 40.00% participants have strongly disagreed that they had now let her/him play outside as s/he aware of the sound of traffic and another (36.00%) participants were disagreed. 32.00% participants answered that s/he still unable to cope in new situations.
Figure 3 demonstrates that more than half of (56.00%) participants were strongly disagreed that s/he (children) still shows signs of frustration do something on own. Majority of the parents (72.00%) agree that they had significant changes of improvement in confidence. More than two third of participants (84.00%) answered strongly agree that s/he (children) were very dependent on parents before the implantation. 36.00% participants have disagreed that children independent as most other children of their age and another (36.00%) participants neither agree nor disagree. Regarding family well-being about 48.00% have agreed that their children showed signs of frustration in behavior. Majority of the parents (56.00%) were agreed that their child’s behavior had improved since implantation. 48.00% participants was agreed that their children became argumentative since getting the implant. 40.00% participants were strongly disagreed that s/he (children) is less frustrated than before the implantation and 36.00% were disagree. Most of the parents (84.00%) were strongly agreed that their children continued to be a happy child. as shown in Figure 4.

Figure 5 shows that Majority of the parents (68.00%) were strongly disagreed that their children did not have a close relationship with grandparents. 40.00% participants were agreed that their children were socially isolated before getting implant and 56.00% sociable within the family. 36.00% participants responded neither agree nor disagree that the children did not make friends easily outside the family. Most of the participants (68.00%) were agreed that their children shared family situations more than before implantation and 64.00% participants were agreed about the child’s relationship with brothers and sisters has been improved.

Analysis of the education and Figure 6 demonstrates that most of the participants (64.00%) were strongly agreed that their children were totally reliant on implant at school. 44.00% participants were agreed that they had a concern
Figure 4. Family well-being of the children with CI.

Figure 5. Social-relationship of the children with CI.

about the child’s future school placement. 48.00% participants were agreed that they (parents) should have a choice in the use of sign language at school. 40.00% participants were happy about their child’s progress at school another 36.00% neither agreed nor disagree. 32.00% participants were agreed that s/he (child’s) was unable to cope with mainstream schooling and another 32.00% have disagreed. 28.00% participants were agreed that s/he (children) is keeping up well with children of his/her own age at school and another 28.00% were disagreed.

Figure 7 demonstrates that 72.00% participants have strongly disagreed that the immediately after implantation their children ability to communicate was poorer. 48.00% participants were strongly agreed that their children progress during the first few months seemed very slow and another 40.00% were agreed.
Figure 6. Education of the children with CI.

Figure 7. Effects of Implantation among the children with CI.

56.00% participants have strongly agreed that their children needed more help from received their child’s implant and another 40.00% were agreed. 44.00% participants responded neither agree nor disagree that their children blame them for the decision to have been implantation. 44.00% participants responded were neither agree nor disagree that progress after implantation has exceeded parent’s expectations. Majority of the participants (64.00%) responded were neither agree
nor disagree that get more time to themselves because of their child’s increased independence. 56.00% participants strongly agreed that their children needed more help from them since received their child’s implantation and another 40.00% were agreed. 40.00% participants were responded neither agree nor disagreed that a lot of help at first means a children needed less help later.

4. Discussion

The study revealed on parent’s perspective that their children were happy, communicative, and talkative and satisfied with their child’s education. The great changes of this study were about spoken language that developed greatly after implantation, which helps to a conversation with others. On the other hand, previous study found that after implantation major outcomes being improvements in communication skills, social relationships and self-reliance [16]. The strongest response of all in this study was that parents reported agreeing that they were able to attract their child’s attention by calling them, thus making communication within the family easier [17]. In another study, parents reported that the change to spoken language at home rather than sign language and the child’s preference for spoken language as it was the easiest means of communication. In this study, most of the parents (64.00%) answered agree that the quality of their children speech gave them a cause for concern [18]. Beadle et al. (2005) showed that speech intelligibility is improving even five or ten years after implantation [19]. The present study was carried out after implantation, and therefore it is likely that the quality of the speech of these children has been improved according to parents. Results from this study suggest the majority of the parents (68.00%) responded agree that their children were totally reliant on their implant all the time. In a more recent study from interviews with young people with implants was the lack of information about their implant systems [20]. Parents also reported significant changes in confidence as found by Archbold et al. [14]. In this study, the majority of the parents (72.00%) agree that they had significant changes of improvement in confidence. Cowan (1997) reported that the cost-benefits of pediatric cochlear implantation are largely dependent on how much rehabilitation the children need after implantation [21]. The parents of profoundly deaf children in the present study strongly agree (56.00%) with the statement that their children need more support from them after implantation. A major issue for parents in this study was that their child had become very sociable within the family, sharing family situations, close to grandparents and with improved relationships with their siblings. In this study, most of the parents (68.00%) were respond strongly disagree that their children did not have a close relationship with grandparents. The everyday language of the home, of siblings and grandparents after implantation facilitates full participation in family life. Education remains a major issue for parents [22]. Although parents report that they are largely happy with their child’s education, a significant proportion are concerned about the future and feel their child is not keeping up
with other children of the same age. The attainment of mainstream schooling has been seen as a measure of the success of cochlear implantation [23]. The majority of the children in the present study were in mainstream education, with 32.00% parents were agreed and 32.00% parents disagreed integrated into the mainstream school. With regard to the communication mode in school, over 80% of parents felt that they should have a say in the use of sign language in school. A study by Watson et al. (2007) interviewing parents about the changes from using sign language to spoken language found that parents wanted to be able to choose communication mode [18]. Christiansen and Leigh (2004) also found in their study that although parents wanted to spoke the language for their child, they also supported the use of sign language before and after implantation [17]. Spencer (2004) also suggests that it may be possible to find a way forward using both sign language and implants and more flexible thinking in considering communication choices would be helpful [6]. In this study, majority of children in the study used signed communication to some extent prior to implantation and changed to using spoken communication over the years following implantation, as became increasingly useful and confirms others that, while parents have the major goal of spoken language for their children, a majority also value the use of sign or signed support at times.

5. Conclusion

It is concluded that parents are mostly satisfied with the results from implantation. Their children have developed with a social relationship, family well-being, and communication within the family after implantation. Children may learn to use the sensations provided by their implants in different ways, so audiometric measures do not tell us directly about the child’s use of the implant in everyday life. This is why they are often complemented by measures of language development and educational achievement. Children who present with congenital deafness have the potential to reach speech and language outcomes comparable to hearing peers following cochlear implantation. Parents need to be patient as progress takes time, and a number remain concerned about future education, self-reliance, the use of spoken language and feel that outcomes from implantation have not met their expectations. So, speech and language therapist has an important role to play at each of these stages aims to contribute to the assessment, treatment, maximizing and maintenance of abilities relating to general functioning, spoken language and communication.

6. Limitation of the Study

This is the first primary study on QOL for children with CI from the perspective of their parents in Bangladesh. So there were some limitations and barriers during conducting the study. The study was done within short period of time and 25 participants or parents were selected to conduct the whole study. It was a small number of participants to conduct a survey to find out QOL for children with
CIs. Data was collected in Bangla, so there might be a possibility to drop or fall the original meaning of information given by the participants. But the investigator tried to give the original resources in this study. Time and resource were limited that have a great deal of impact on the study. Investigator did not get any financial support to conduct the study and so it was not possible to move and gather more participants or parents from different hospitals around Bangladesh.

**Acknowledgements**

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**Conflicts of Interest**

Authors of the article declare that there is no conflict of interest regarding this article.

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[4] Health Technology Assessment Section (MaHTAS), Medical Development Division and Ministry of Health Malaysia (2009).


A Postimplant Cholesteatoma after Modified Radical Mastoidectomy

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Abstract

A postimplant cholesteatoma is one of surgical complications of cochlear implantation. Hoffman and Cohen (1995) reported that only one out of 172 (0.58%) patients developed a postimplant cholesteatoma. We experienced a case of postimplant cholesteatoma after the modified radical mastoidectomy.

Case:
A 61-year-old man underwent left modified radical tympanoplasty with mastoidectomy for middle ear cholesteatoma at another hospital 40 years ago. We performed right open type tympanoplasty for right cholesteatoma, and at that time there was no recurrent cholesteatoma on the left side. He had already lost the sensorineural hearing in both ears. After three-year-observation with no recurrence of cholesteatoma in both ears, the patient underwent a left cochlear implantation with a Nucleus-24 channel device. After 1 year, we found new lesion of cholesteatoma in the left attic, and removed it by transtympanic approach. There has been no recurrence of cholesteatoma for 12 years.

Conclusion:
In long-standing middle ear problems, when we perform cochlear implantation, even though there is good aeration of the middle ear and an intact tympanic membrane, we need to adequately reflect on the area which should be obliterated.

Keywords
Cochlear Implant, Cholesteatoma, Modified Radical Mastoidectomy

1. Introduction

Cochlear implantation has become a safe and effective method for auditory rehabilitation of severe to profound sensorineural hearing loss (SNHL). Cochlear implantation has standard procedure, and the overall incidence of complications following cochlear implantation is within acceptable levels. Several condition
may, however, require revision surgery and even explantation; they include device failure, electrode extrusion, flap infection, and middle ear problems (chronic otitis media, cholesteatoma) [1]. Postimplant cholesteatoma is one of the surgical complications of cochlear implantation (CI). Hoffman and Cohen reported that only one out of 172 (0.58%) patients developed a postimplant cholesteatoma [2]. Kempf et al. described the formation of cholesteatoma after CI was found in 0.2% (n = 366) of the pediatric patients [3].

In past, contraindications to cochlear implantation have included chronic otitis media sepsis, since the insertion of a foreign body through a potentially infected field can lead to intracranial spread of infection [4]. Although chronic middle ear disease is one of the etiologies of profound deafness in postlingual adults, many authors reported various surgical strategies for cochlear implantation with chronic middle ear lesion to avoid complications [5] [6] [7] [8] [9]. We report a case of postimplant cholesteatoma after modified radical mastoidectomy.

2. Case

Postlingually deafened 61-year-old man was introduced to our hospital to be evaluated for cochlear implantation. He received left modified radical mastoidectomy for left cholesteatoma at another hospital 40 years ago. After the operation, he had profound sensorineural hearing loss in the left ear. He had acute profound sensorineural hearing loss in the right ear by cholesteatoma 22 years ago. He was introduced to our hospital for cochlear implantation in 2002. He had already lost sensorineural hearing in both ears. Although he had worn bilateral hearing aids, he had very little word intelligibility. Clinical examination revealed that there was right open mastoid cavity by cholesteatoma and there was no recurrent cholesteatoma on the left side (Figure 1(a) and Figure 1(b)). Computed tomography (CT) showed a low density area in the right mastoid antrum (Figure 2(a)), but no low density area in the left mastoid cavity (Figure 2(b)).

We performed right open type tympanoplasty in 2002, and at that time there was no recurrent cholesteatoma on the left side. After three-year-observation with no recurrence of right cholesteatoma, the patient underwent a left cochlear implantation with a Nucleus-24 channel device. We performed posterior tympanotomy and cholesteatomy after the left modified radical mastoidectomy. There was no cochlear ossification and we inserted easily the implant array. The left open mastoid cavity was obliterated with abdominal fat (Figure 3) and the posterior wall of the external auditory canal was reconstructed with auricular cartilage. Because the aeration of the middle ear was good, we did not block the eustachian tube and external auditory canal, and did not obliterate the attic. Left otoscopic examination after implantation was good (Figure 4). After programming in the ACE mode, his speech discrimination word score was 72%.

In 2006, we found a new cholesteatoma in the left attic (Figure 5), and removed it by transcanal approach for preserving cochlear implant device. We
Figure 1. (a) A right cholesteatoma in open cavity; (b) Left open type tympanoplasty with mastoidectomy for middle ear cholesteatoma.

Figure 2. (a) Low density area in the right mastoid antrum; (b) No low density area in the left mastoid cavity.
obliterated the attic with bone chips in order to prevent recurrent cholesteatoma (Figure 6). Even after the operation, the function of the left cochlear implant device was not changed. There has been no recurrence of cholesteatoma for 12 years.

Figure 3. The left open mastoid cavity obliterated with abdominal fat. Arrow: cochlear implant array.

Figure 4. Left otoscopic examination after implantation.

Figure 5. Recurrent cholesteatoma in the attic (arrow).
3. Discussion

Some of the surgical problems encountered in cochlear implant surgery are related to cholesteatoma. Furthermore, cholesteatoma has occurred as a complication of cochlear implant surgery itself. Hoffman and Cohen reported that only one out of 172 (0.58%) patients developed a postimplant cholesteatoma [2].

In past, contraindications to cochlear implantation have included chronic otitis media sepsis such as previous radical mastoidectomy [4]. In patients who performed radical mastoidectomy, one of the most common postoperative complications is the extrusion of the electrode array into the mastoid cavity or external auditory canal [1]. In these chronic middle ear diseases, it requires surgical management to render an ear safe.

During recent years, different surgical strategies for cochlear implantation with chronic middle ear problems demonstrated that the selection of closed technique or open technique for arrangement of open mastoid cavity [10]. Many surgeons recommend the closed technique that obliteration and isolation of the cavity from the outer environment by blind sac closure of the external auditory canal and obliteration of the eustachian tube opening [1] [10] [11] [12]. There are bone pate, hydroxyapatite, pedicled temporalis muscle graft, and autologous abdominal fat graft as obliterating materials. Autologous abdominal fat graft have many advantages such as abundant supply, easy accessibility, low metabolic and resistance to necrosis when used as a free graft in a bony cavity [13]. Closed technique is that the infection risk associated with the insertion of foreign material is reduced but is at risk for residual or recurrent cholesteatoma. On the other hand, open technique is better control a potential recurrent cholesteatoma, but difficult to control the infection. Karatzanis et al. reported that open technique should be chosen in some cases [14].

Another surgical strategy for cochlear implantation with chronic middle ear problems is the selection of single-stage or second-stage operation. In patients

![Figure 6. The attic obliterated bone chips (arrow).](image)
who have middle ear problems, depending on the presence of active infection or cholesteatoma, a second-stage operation should be considered to enable a successful CI [1]. In patients who performed radical mastoidectomy with no cavity problem, the selection of single-stage or second-stage operation is controversial issue. Gray and Irving [6] proposed the obliteration technique prior to cochlear implantation for cases which have middle ear disease with no active infection. This technique involves obliteration of the eustachian tube, obliteration of the mastoid cavity with free abdominal fat, and permanent closure of the external ear canal. Meanwhile, Himi et al. [12] suggested that in patients with “safe type” chronic otitis media did not need the second-stage operation. In an old radical cavity with no cavity problem, they had no postoperative complication using a single-stage operation.

In our case, there has been no middle ear problem in the left ear for 20 years with good aeration in the tympanic cavity. We decided to perform a single-stage operation and mastoid cavity obliteration. We did not perform eustachian tube occlusion, blind sac closure of the external canal and obliterate in the attic. As a result, a new cholesteatoma appeared in the left attic. We had to perform re-operation to remove the new cholesteatoma, but could preserve the function the implant device. Although we should have obliterated the attic which was a open cavity before the operation, we could find the new cholesteatoma since we did not perform closed technique and partially obliterate only open mastoid cavity. When we perform the cochlear implantation in modified radical mastoid cavity, we need to adequately reflect on the area which should be obliterated. In some cases with modified radical mastoid cavity, we think that closed technique and second-staged operation have not always been performed.

4. Conclusion

In long-standing middle ear problems, when we perform cochlear implantation, even though there is good aeration of the middle ear and an intact tympanic membrane, we need to adequately reflect on the area which should be obliterated.

Conflicts of Interest

The authors declare no conflicts of interest.

References


Factors Influencing Prognosis in the Endoscopic Extraction of Foreign Bodies in Kashmiri Population

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Abstract

An updated approach in the management of 50 patients with foreign body inhalation is presented. Certain risk factors that lead to complications and mortality due to endoscopic extraction of foreign bodies and thus determine prognosis were identified. Remedial measures to reduce morbidity and mortality due to bronchoscopic removal of foreign bodies are suggested. Fifty patients of suspected foreign body inhalation presented to a Unit of the Department of ENT, Head and Neck Surgery of Government Medical College associated SMHS Hospital Srinagar, Kashmir from March 2007 to June 2017. Of these, 49 patients were subjected to rigid tube bronchoscopy for removal of the aspirated foreign bodies and one coughed out the foreign body spontaneously during admission for bronchoscopy. History of foreign body inhalation was positive in 90% of patients and remaining was mostly referred from Paediatric Units with un-resolving collapse-consolidation of the lung.

Whereas plain radiography of the chest and the soft tissues of neck were the primary imaging modality used in this study to detect the inhaled foreign bodies or their effects there are reports of virtual bronchoscopy being done with a multidetector computed tomography scanner in 3D image generation from axial cuts of the internal walls of the tracheobronchial tree in the management of patients suspected with foreign body aspiration. Bronchoscopy is a difficult and potentially hazardous procedure in the infant and young child. Telescopes and telescopic forceps were used during bronchoscopy to facilitate extraction of a foreign body inhaled. The type of a foreign body, site of its lodgement and the complications encountered during its extraction were noted. During bronchoscopy the patients were connected to an ECG monitor.
and a pulse oximeter. 80% of the patients with foreign body inhalation were children in the age group of 0 - 5 years. There was a definite history of choking over the foreign body in 88% of the patients leading to acute respiratory distress in 46%. Cough alone or along with other symptoms occurred in most of the patients (96%). Persistent fever with respiratory symptoms unresponsive to treatment occurred in 38% of the patients with or without a positive history of foreign body inhalation. Right main bronchus was the commonest site of enlodgement of foreign body. In the present study, bean and peanut were the commonest types of foreign bodies inhaled (34%). Radiological findings in these patients include atelectasis with or without pneumonia in 46.65% of the patients, normal chest/soft tissues of the neck in 24.45%, obstructive emphysema on the affected side in 24.45%, foreign body seen in the respiratory tract in 8.90% and bronchopneumonia in 2.22%. Complications associated with the endoscopic extraction of foreign bodies and the risk factors that lead to complications and mortality in patients with aspirated foreign bodies were identified in this study and the measures to reduce these complications and mortality rate to very low levels were suggested. Transient hypoxia, hypoxic bradycardia, transient cardiac arrest, bronchial perforation and death, laryngospasm, bronchospasm, subglottic oedema, reflex bradycardia and pneumothorax were among the few complications which occurred with the rigid endoscopic extraction of foreign bodies in the present study. Among the risk factors associated with the complications were prolonged bronchoscopy, semi-blind procedure, a vegetable foreign body, improper size and positioning of a bronchoscope and some other important factors which are detailed in the text of this paper to follow. Remedial measures on the basis of complications and the risk factors are suggested so as to decrease the morbidity and mortality due to endoscopic extraction of foreign bodies inhaled into the tracheobronchial tree.

**Keywords**
Inhaled Foreign Bodies, Collapse-Consolidation, Obstructive Emphysema, Virtual Bronchoscopy, Rigid Tube Bronchoscopy, Hypoxic Bradycardia, Bronchospasm, Subglottic Oedema, Pneumothorax, Tracheostomy, Prognosis

1. Introduction

Foreign bodies inhaled into the larynx and trachea can cause total respiratory obstruction and death within a few minutes if help is not ready to hand. Two engravings in Egypt record the performance of tracheostomy by Egyptians about five thousand and six hundred years ago [1]. Boo Ali Ibne-Sina (Avicenna) quoted by Bradley [2], in the tenth century A. D. advocated tracheostomy for otherwise hopeless cases of the airway obstruction. Foreign bodies inhaled into the bronchus cause atelectasis with or without pneumonia (Figure 1) or obstructive emphysema (Figure 2) in most of the patients and if neglected can lead...
Figure 1. Foreign body in left main bronchus causing atelectasis with pneumonia.

Figure 2. Obstructive emphysema right lung base due to foreign body impaction.
to formation of lung abscess. In most cases of inhaled foreign body there is a definite history of choking followed by paroxysmal coughing which later subsides. Modern techniques of endoscopic removal of bronchial foreign bodies were the result of the advances made in early part of the twentieth century by Chevalier Jackson who succeeded in reducing mortality from the procedure significantly. The advent of ventilating bronchoscope, improvement in the illumination and magnification provided by Hopkins’ rod lens system, fibre optic bronchoscopy, virtual bronchoscopy [3] and advances in anaesthesia have markedly reduced mortality rate due to endoscopic extraction of inhaled foreign bodies.

2. Materials and Methods

This study is a prospective randomized clinical trial in which fifty patients of suspected foreign body inhalation who presented to the Department of ENT, Head and Neck Surgery of the Govt. Medical College associated SMHS Hospital Srinagar, Kashmir directly or through referral from other hospitals in the State over a period of 5 years from March 2007 to June 2017 were subjected to rigid tube bronchoscopy for removal of aspirated foreign bodies. Majority of the patients in this series were children. The youngest patient was 6 months old and the oldest was of 22 years of age. Infants or children with foreign bodies impacted in the larynx or in the trachea who presented with stridor, choking and coughing were subjected to emergency tracheostomy before bronchoscopy. Falling oxygen saturation after a prolonged bronchoscopy is usually indicative of subglottic oedema, bronchospasm or pneumothorax, and may also need airway assistance. Radiography of the chest before bronchoscopy was done in 46 patients (92%) and was repeated after the procedure in all of the patients who survived. The distribution of foreign bodies at various sites in the respiratory tract is depicted under observations. The type of foreign body and the complications encountered during the procedure were noted. Bronchoscopes used for children relating the size of the instrument to the age of the child are tabulated below (Table 1). Telescopes, telescopic forceps, and fibre optic bronchoscope can be passed along the metallic rigid tube bronchoscope to facilitate extraction of a foreign body. There is a wide selection of foreign body extraction forceps available for every individual type of a foreign body. During the procedure the patients’ heart rate was monitored and the oxygen saturation level continuously perceived with an oximeter.

3. Observations

Age and sex distribution: Age of the patients with foreign body inhalation ranged from 6 months to 22 years, including five infants with age below 1 year. The average age of the patients was 3 years and 4 months. 80% of the patients belonged to the age group of 0 - 5 years. 74% of the patients were male and 26% were female. Table 2 depicts the age and sex distribution in 50 patients with foreign body inhalation.
Clinical features: There was history of choking over the foreign body in 88% of the patients leading to acute respiratory distress in 46%. Cough alone or along with other symptoms occurred in most of the patients (96%). Persistent fever with respiratory symptoms un-responsive to treatment occurred in 38% of the patients with or without a positive history of foreign body inhalation; and a loud wheeze in the chest was audible in 16%. Loud whistling sound was heard from a plastic whistle impacted in the right principal bronchus in one patient (2%).

History of foreign body inhalation was positive in most of the patients (90%) and the remaining were mostly referred from the Paediatric Units of other hospitals with unresolving collapse-consolidation of the lung. Duration of enlodgement of foreign bodies ranged from 1 hour to 2 months. Decreased breath sounds on the affected side were the most common examination finding (78%).

Radiological signs: Of 50 patients with the history of inhalation of foreign body radiography of chest/soft tissues of neck was done in 45 patients and in the remaining 5 radiograph could not be obtained because of urgency of foreign body removal. Radiological signs due to the inhalation of foreign bodies in the present study included atelectasis of lung with or without consolidation in 46.67%, normal chest/soft tissues of neck in 24.44%, obstructive emphysema in 17.78%, foreign body seen in the respiratory tract in 8.89% (Figure 3 and Figure 4) and bronchopneumonia in 2.22%. Table 3 depicts these results.

Treatment: Laryngeal foreign bodies in this study were successfully extracted by emergency tracheostomy followed by endoscopy in 6% of the total number of patients, direct laryngoscopy with Mackintosh laryngoscope in 4%, and rigid
Figure 3. A plastic whistle seen in left main bronchus with atelectasis of lung.

Figure 4. A scarf pin seen in left main bronchus.
Table 3. Radiological Signs in 45 patients with foreign body inhalation.

<table>
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<th>Radiological sign</th>
<th>No. of Patients</th>
<th>% age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atelectasis of lung with or without consolidation</td>
<td>21</td>
<td>46.65</td>
</tr>
<tr>
<td>Normal chest/Soft tissues of neck</td>
<td>11</td>
<td>24.45</td>
</tr>
<tr>
<td>Obstructive emphysema</td>
<td>8</td>
<td>17.78</td>
</tr>
<tr>
<td>Foreign body seen</td>
<td>4</td>
<td>8.90</td>
</tr>
<tr>
<td>Bronchopneumonia</td>
<td>1</td>
<td>2.22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>100</strong></td>
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tube bronchoscopy without preliminary tracheostomy in 2% whereas a laryngeal foreign body was spontaneously coughed out by one patient (2%). Tracheal and bronchial foreign bodies were removed using different sizes of the metallic ventilation bronchoscope with respect to the age of the patient.

Type of the foreign body: Children can inhale whatever foreign material comes in their way. Of vegetable foreign bodies 80% of the patients inhaled beans, peanut and maize grains. Of inert foreign bodies plastic whistles and pen caps were commonly aspirated foreign bodies (18% of the patients). Table 4 shows the type of foreign body inhaled in 50 patients.

Location of foreign body in the respiratory tract: Right main bronchus was the commonest site of enlodgement of foreign body (46% of the cases) in this study followed by left main bronchus (22%), trachea (12%), subglottis (8%), carina (4%), glottis (2%), glottis to subglottis (2%), all sites of respiratory tract (2%) and undetermined (2%). Table 5 depicts the site of foreign body enlodgement in 50 patients.

Complications and risk factors: Complications associated with the endoscopic extraction of inhaled foreign bodies can be serious (Figure 5) and many occasionally prove fatal. Mortality rate due to the rigid tube endoscopic removal of foreign bodies in this study was 8%. Certain risk factors that lead to complications were identified and included the age below 1 year, a vegetable foreign body, prolonged bronchoscopy beyond 20 minutes, traumatic procedure by an occasional less experienced endoscopist in the learning phase, occasional less skilled anaesthetist, improper instrumentation and delayed patient presentation or delayed referral when pneumonitis has already supervened. Complications and the associated risk factor due to the rigid tube bronchoscopic extraction of inhaled foreign bodies in forty nine patients are enlisted in Table 6.

4. Discussion

Foreign body inhalation is a major cause of accidental death during childhood [4]. 90% of the patients in the present series were children below 5 years; and this age incidence is comparable to many other studies [5] [6] [7] [8]. Elhassani et al. [9], however, report in Iraq foreign body inhalation is more frequently seen in infants. The factors contributing to the inhalation of a foreign body in
Figure 5. Right-sided pneumothorax complicating tracheostomy in a patient with subglottic plastic pen-cap impaction.

Table 4. Showing the type of foreign body inhaled in 50 patients.

<table>
<thead>
<tr>
<th>Organic (reactive) foreign body</th>
<th>No. of patients</th>
<th>% (of the total cases)</th>
<th>Inert (non-reactive) foreign body</th>
<th>No. of patients</th>
<th>% (of the total cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bean</td>
<td>12</td>
<td>24</td>
<td>Plastic whistle</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Peanut</td>
<td>5</td>
<td>10</td>
<td>Plastic pen cap</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Maize grain</td>
<td>3</td>
<td>6</td>
<td>Pill cover</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Almond shell</td>
<td>3</td>
<td>6</td>
<td>Scarf needle</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>A piece of vegetable</td>
<td>2</td>
<td>4</td>
<td>Egg shell</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cherry seed</td>
<td>1</td>
<td>2</td>
<td>Metallic bead</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cover of peanut</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin seed</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A piece of walnut</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A piece of waternut</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pea seed</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposed paper</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A piece of cashew nut</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A piece of coconut</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bone piece</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 5. Site of foreign body enlodgement in the respiratory tract in 50 patients.

<table>
<thead>
<tr>
<th>Site</th>
<th>No. of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right main bronchus</td>
<td>23</td>
<td>46</td>
</tr>
<tr>
<td>Left main bronchus</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Trachea</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Subglottis</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Carina</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Glottis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Glottis to subglottis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>All sites</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Undetermined (spontaneously coughed out)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### Table 6. Complications associated with the bronchoscopic extraction of foreign bodies in 49 patients.

<table>
<thead>
<tr>
<th>Complication</th>
<th>No. of patients</th>
<th>% of the total bronchoscopies/D.L</th>
<th>Associated risk factor/factors</th>
<th>No. of patients</th>
<th>% of the total bronchoscopies/D.L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient hypoxia</td>
<td>3</td>
<td>6.12</td>
<td>1) Age below 1 year 2) Pre-existing pneumonia due to delayed presentation/referral in an infant (below 1 year)</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Hypoxic bradycardia</td>
<td>2</td>
<td>4.08</td>
<td>1) Age below 1 year 2) Lighter plane of anaesthesial/less skilled anaesthesit) 3) Improper size and positioning of a bronchoscope</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Transient cardiac arrest</td>
<td>2</td>
<td>4.08</td>
<td>1) Vegetable foreign body necessitating prolonged bronchoscopy in an infant below 1 year 2) Semiblind technique without using a telescope or telescopic forceps (thus prolonging the procedure)</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Cardiac arrest and death</td>
<td>1</td>
<td>2.04</td>
<td>Vegetable foreign body necessitating prolonged bronchoscopy</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Bronchial perforation and death</td>
<td>2</td>
<td>4.08</td>
<td>Less skilled bronchoscopist</td>
<td>2</td>
<td>4.08</td>
</tr>
<tr>
<td>Reflex bradycardia</td>
<td>1</td>
<td>2.04</td>
<td>Age below 1 year</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Bronchospasm</td>
<td>1</td>
<td>2.04</td>
<td>Delayed referral with pre existing pneumonia</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Misdirection of bronchoscope into oesophagus</td>
<td>1</td>
<td>2.04</td>
<td>Less skilled bronchoscopist</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Laryngospasm</td>
<td>1</td>
<td>2.04</td>
<td>Less skilled bronchoscopist with laryngeal trauma</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Subglottic oedema</td>
<td>1</td>
<td>2.04</td>
<td>Vegetable foreign body necessitating prolonged bronchoscopy</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>1</td>
<td>2.04</td>
<td>Vegetable foreign body necessitating prolonged bronchoscopy</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Surgical emphysema neck, chest</td>
<td>1</td>
<td>2.04</td>
<td>Less skilled bronchoscopist with a traumatic procedure</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Cerebral anoxia and death</td>
<td>1</td>
<td>2.04</td>
<td>Vegetable foreign body necessitating a prolonged procedure</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td>Paralytic ileus</td>
<td>1</td>
<td>2.04</td>
<td>Vegetable foreign body necessitating a prolonged procedure forced ventilation for hypoxia (with mask)</td>
<td>1</td>
<td>2.04</td>
</tr>
</tbody>
</table>
younger children more commonly than in adults seem to be the anatomic relations of the larynx in children which is high up and more posteriorly placed in the neck; difficulties in chewing due to the lack of molars; their tendency to put almost every object in mouth for exploring its texture and taste; shouting, crying and playing while eating which open the laryngeal inlet reflexly; recurrent upper respiratory infections, coughing and mouth breathing causing sharp intake of breath which follows a cough; and finally the poorly co-ordinated swallowing reflex. Male to female ratio in our study was nearly 3:1. In the studies made by Rothman and Boeckman [10] and O’Neill, Holcomb and Neblett [11] boys were more likely to inhale foreign bodies than girls in a ratio of 2:1. In most cases of the inhaled foreign body there is a history of choking which may lead to acute respiratory distress. Anissa Berraies et al. [12] report that choking is the most specific symptom with a good sensitivity for the diagnosis of foreign body aspiration. Cough alone or along with other symptoms occurred in most of the patients in the present study. After the initial episode of choking and coughing the respiratory mucosal cough reflex dulls and the cough ceases which may lead to delay in diagnosis with different clinical presentations including persistent fever with respiratory symptoms unresponsive to treatment (accounting for 38% of the patients in this study), a loud wheeze in the chest (16%). History of foreign body inhalation was positive in 90% of the patients in this series and the remaining was referred from other paediatric hospitals with unresolving collapse-consolidation of the lung. Duration of enlodgement of the foreign body was one hour to 2 months. Kamaljit Kour (2002) observed a diagnostic triad of cough, wheezing and decreased breath sounds on the affected side of the chest in patients with foreign body inhalation. In the series of Mahyar and Torlan (2008) with foreign body aspiration clinical history of foreign body inhalation was observed in 57.4%, and included cough in 90%, wheeze in 39.6%, and decreased pulmonary sounds in 36.6%. Asif et al. [13] report choking to be the most common symptom and decreased air entry on auscultation on the affected side to be the typical finding of an inhaled foreign body. Nazar B. Elhassani (1978) reports nearly 50% of the children with foreign body inhalation were seen within 24 hours of the incident and most of these presented with cough and wheezing respiration.

The most common radiological sign in patients with foreign body inhalation in the present study were atelectasis of the lung with or without consolidation (46.6%) followed by normal chest/soft tissues of neck in 24.44%, obstructive emphysema in 17.78%, foreign body seen in the respiratory tract in 8.89% and bronchopneumonia in 2.22%. According to the study of Jennis Dennilidis et al. [14] the most common radiological finding in these patients was the obstructive emphysema corresponding to the bronchus containing the foreign body and was associated with mediastinal shift to the opposite side. The other radiological signs observed by these authors were atelectasis due to complete bronchial obstruction; pneumonia; bronchopneumonia; and finally the visibility of a foreign body in the x-ray film. In the Tunisian study of Anissa Berraies (2015) 18% of
the patients with FBA had normal radiography whereas air-trapping was observed in 60% of cases mainly in the early diagnosed forms. In the later diagnosed patients in their study atelectasis and pneumonia were more often detected. Although spontaneous expulsion of the inhaled foreign body can occur (2% in the present series) rigid tube bronchoscopic removal of the inhaled foreign bodies is the treatment of choice [15]. Careful examination of the instrument before use is important to reduce the complications and to shorten the duration of the procedure, which is directly proportional to the morbidity and mortality rates. Good interaction is necessary between the endoscopist and the anaesthesiologist. All types of foreign bodies in the present study could be removed with a ventilation bronchoscope; however, thoracotomy has been reported as a method of removing inhaled foreign bodies such as nail, bead or bone that may not be grasped with an endoscopic forceps [16]. Fibreoptic bronchoscope can remove the inhaled foreign bodies in a good percentile of patients (Cananan 1978). Virtual bronchoscopy as a non-invasive imaging method has potential for use in detecting foreign bodies in the airways of children and can even preclude the need to submit these children to rigid bronchoscopy in the absence of a foreign body [17]. The type of foreign body inhaled usually depends on geographical regions of the world. Bean was the commonest foreign body inhaled in this study. Children have easy access to beans as these are sundried after harvesting in rural areas of Kashmir. Watermelon seeds are the most frequently found inhaled foreign bodies in Turkey and Middle East as reported respectively by Aytac et al. (1976) and El-Hassani (1978) because in summers this fruit is commonly available and cheaper one in these areas. Nutty substances were found to be inhaled commonly in winters in their series. Dry pumpkin seeds are commonly inhaled in Greece because of Greek habit of eating them. Right main bronchus was the commonest site of enlodgement of the foreign body in the present study (50%) followed by left main bronchus (32%), trachea (10%), carina (4%), subglottis (2%), and glottis (2%). Many studies report right main bronchus to be the most common site of enlodgement of foreign body citing the anatomy as a possible reason as it is a direct continuation of trachea (Elhassani 1978) which, however, has not been confirmed by others [18]. The latter found equal incidence of foreign bodies in the left or right main bronchus whereas in Jennis series of 90 cases the site of foreign body was predominantly found in left main bronchus in children and right main bronchus in adults giving explanation that the children usually inhale while lying down and hold the foreign body with the right hand. They comment, in this position the angle between the trachea and the left bronchus is somewhat straightened. The anatomical considerations that the right main bronchus is nearly a direct continuation of trachea and, therefore, the more common site of foreign body enlodgement according to these authors probably applies to adults. Gyebre, Y. et al. [19] report that the laryngeal foreign bodies are common and grave, and the most common presentation is dyspnoea with dysphagia in the previously healthy children. Most of the complications (89.48%) associated with foreign body removal in children with rigid broncho-
Endoscopic examination in the present series of patients were related to the operative and post-operative hypoxaemia. Other complications were rare and included surgical emphysema of the neck and chest in one patient (5.26%) and paralytic ileus in one (5.26%). Mortality rate due to the rigid tube endoscopic extraction of foreign bodies in the present study was 8% which is higher than the many other reported series viz., Mahyarand Tarlan 2008—0.9%, Mohammad Shafi et al. 2012—6%, and, Abdulaziz O. A. et al. 2014—2.70% to 8.30% in various hospital studies. However, Cunanan [20] found a much higher mortality rate (12%) using a rigid system compared to 1% using flexible fibre optic bronchoscopy. Certain risk factors that lead to hypoxaemic complications and mortality during endoscopic extraction of foreign bodies in the present series of patients were identified and included a vegetable foreign body necessitating a prolonged bronchoscopy beyond 20 minutes in patients below 3 years of age especially the infants, improper size and positioning of a bronchoscope, a semi-blind procedure without using a telescope or telescopic forceps, inadequate patient preparation and a lighter plane of anaesthesia, late presentation or delayed referral, failure to resuscitate a hypoxic patient during anaesthesia, inadequate knowledge about the bronchopulmonary anatomy, failure to recognize and manage a complication such as pneumothorax during or after bronchoscopy, and a less-skilled anaesthetist/bronchoscopist. Harboyan and Nassif [21] reported 36 instances (16%) of tracheostomy in 225 bronchoscopies, mostly in the prolonged traumatic procedures. Bittencourt et al. [22] analysed the variables associated with hypoxaemia in children who underwent rigid bronchoscopy for foreign body removal. Among the patients aged up to one year the risk of hypoxaemia was five and half times higher than for patients aged one year or older (OR = 5.6). Furthermore, for each additional minute in the duration of the procedure the risk of hypoxaemia reached 4% (OR = 1.04). Chen L. H. et al. [23] identified risk factors associated with intraoperative or with postoperative hypoxaemia in rigid bronchoscopy for foreign body extraction in children and conclude that five factors strongly correlated with intraoperative hypoxaemia: younger age, plant seed as the type of foreign body, longer operative duration, pneumonia before the procedure and spontaneous ventilation mode; and these factors significantly increased the risk of intraoperative hypoxaemia, whereas manual jet ventilation mode decreased it. Two factors were associated with postoperative hypoxaemia: plant seed as a foreign body and prolonged duration of emergence from anaesthesia. Jennis Dannilidis et al. (1977) suggest that special attention is needed in cases with vegetable foreign body inhalation which due to bronchial secretions increase in size, become soft and are easily broken to pieces on handling them with instruments and can get dispersed as small pieces in distal bronchi. Moreover, the vegetable foreign bodies induce intense inflammation in the tracheobronchial tree. According to Ross and McCormick [24], dry vegetable foreign bodies, for example a bean, cause very rapid obstructive changes due to a combination of mucosal irritation and the swelling of the bean itself by hygroscopic action. Atelectasis of the occluded segment of lung occurs with utmost rapidity...
in this type of foreign body. Limper et al. [25] noted 60.87% successful retrievals with the flexible, and 97.73% with the rigid bronchoscope. Nadir Saki et al. [26] in their 20 year experience with the management of aspirated foreign bodies in infancy comment that bronchoscopy in children under 12 months requires skill because technical difficulties due to small instrumentation and bronchospasm commonly occur when compared to older children. They suggest that a bronchoscope of appropriate diameter should be chosen and the procedure should ideally be limited to 20 minutes in order to avoid subglottic oedema and bronchospasm due to bronchoscopy. Christian W. Fidkowski et al. (2010) in their review of large series of paediatric bronchoscopies for extracting aspirated foreign bodies report mortality due to rigid bronchoscopy as 0.42%. While asphyxia at presentation or initial bronchoscopy causes some deaths, hypoxic cardiac arrest during retrieval of the object, bronchial and unspecified intraoperative complications in previously stable patients constitute the majority of in-hospital fatalities. Major complications include severe laryngeal oedema, bronchospasm requiring tracheostomy or reintubation, pneumothorax, pneumomediastinum, cardiac arrest, tracheal or bronchial laceration and hypoxic brain damage. Although several anaesthetic techniques are effective for managing children with foreign body aspiration, there is no consensus according to these authors from the literature as to which technique is optimal. T. Vittal Mohan et al. [27] in a retrospective study of 108 cases of tracheobronchial foreign bodies recommend the use of proper instrumentation, thorough training and teamwork to be the key to achieve goal of zero mortality and no major complications in removing the inhaled foreign bodies. Brkic F. et al. [28] suggest the health care education to be the key to prevention of foreign body inhalation. Abdulazeez Omeza Ahmad and IliyasuYunusa Shuiabu (2014) advocate strong legislature to be put in place to regulate the sweet or toy producing companies on whistles (toys) manufactured with candies, and if possible these be totally withdrawn from the market. Besides, the parents have a fundamental role to play by providing constant supervision to children particularly in the infants H. Chew and H. Tan [29] suggest a high clinical suspicion and prevention to be the key factors in the management of inhaled foreign bodies in children. Mohammad Shafi et al. (2012) comment that delay in the diagnosis of foreign body inhalation translates into a higher risk of complications and suggest early bronchoscopy to be done on the suspicion of an inhaled foreign body. According to these authors the causes of mortality related bronchoscopic extraction of foreign body include delayed bronchoscopy, and lack of expertise on the part of surgeon and the anaesthetist. Prolonged presence of foreign body in the airway can lead to irreversible changes in the lung with increased morbidity and mortality. Deaths due to bronchoscopy in their study occurred due to severe acute respiratory distress with cyanosis and attendant cerebral anoxia; and one due to profuse haemorrhage from granulations around an impacted foreign body.

Anissa Berraies et al. (2015) while admitting rigid bronchoscopy to be a gold standard for the inhaled foreign body extraction comment that there is an in-
increased role of flexible fibre-optic bronchoscopy in the treatment of inhaled foreign bodies in children for whom the diagnosis of foreign body aspiration is doubtful. They recommend performing a flexible endoscopy in all children with suspected foreign body aspiration, except those with respiratory distress or a radio-opaque foreign body. First, according to these authors, it will avoid unnecessary rigid bronchoscopy in children without foreign body, or with foreign body that is located in distal bronchus and is, therefore, difficult to remove using a rigid bronchoscope. Secondly, it will localise the foreign body and thus guide the bronchoscopist. In their experience, flexible bronchoscope was used for foreign body removal in cases where the ENT specialist had not seen the foreign body because it was distal, or when attempt to remove the foreign body by rigid bronchoscopy failed. Flexible bronchoscopy was not attempted by these authors for proximal foreign bodies, friable foreign bodies and when it can become blocked in the larynx.

Rodriguez H et al. [30] report the technique of choice for removing aspirated foreign bodies is rigid bronchoscopy. The indication for flexible bronchoscopy according to these authors is primarily the verification of an uncertain diagnosis, or for its combination with rigid method, or the recovery of very small distally situated foreign bodies, and should not in principle be used as the primary technique for removal of all foreign bodies. Therefore, switching to the rigid technique should be possible at any time.

Remedial measures to reduce morbidity and mortality and thus improve prognosis in the endoscopic extraction of the inhaled foreign bodies are summarised as below:

- Incidence of foreign body inhalation can be significantly decreased if public awareness about not keeping extraneous material accessible to young children is increased. Parents have fundamental role in providing constant supervision to children especially in their infancy. Children have a natural tendency to explore foreign material and often put it in mouth and can inhale it especially as their swallowing mechanism is also not mature and coordinated. Moreover, it is suggested, toys such as plastic whistles manufactured with the candies to allure children be totally withdrawn from the market.
- Early suspicion of foreign body inhalation and early referral to the endoscopist by the paediatricians, chest physicians or the general practitioners to whom the patient may initially present is highly emphasised on the basis of the present study because bronchoscopy on a child with pre-existing pneumonia due to a neglected foreign body was observed to increase the risk of intraoperative hypoxaemia. Besides, delay in diagnosis of foreign body inhalation and its extraction can lead to irreversible changes in the lungs with increased morbidity and mortality.
- Review of literature on the management of suspected foreign body aspiration in children shows virtual bronchoscopy being done with a multidetector C.T. Scanner in 3D image generation from axial cuts of the internal walls of the
tracheobronchial tree which can indicate exact location of the foreign body and even preclude the need to submit patient to rigid bronchoscopy in the absence of a foreign body. Flexible fibre optic bronchoscopy has also been recommended with the same purpose (Anissa Barraies et al. 2015) in the management of suspected foreign body inhalation in all children except those with respiratory distress or a radio-opaque foreign body. Flexible bronchoscopy will avoid unnecessary rigid bronchoscopy in children without foreign body or with a foreign body which is located in distil bronchus. Besides, fibre-optic bronchoscope will localize the foreign body and so guide the subsequent rigid tube endoscopy when indicated.

- The endoscopist must have thorough knowledge about the brocho-pulmonary anatomy at different ages of an individual.

- In the present study use of 10% lignocaine spray into the laryngeal interior shortly before introducing the bronchoscope was observed to lessen the incidence of reflex bradycardia and cardiac arrest dramatically. Atropine is also routinely given to the patients before induction of anaesthesia for bronchoscopy and also during bronchoscopy for the treatment of bradycardia. Succinylcholine given in a controlled dosage fashion during anaesthesia prevents laryngospasm. Besides, jet ventilation mode of anaesthesia for extraction of the inhaled foreign body has been reported to decrease the intraoperative hypoxaemia whereas the spontaneous mode increases it (Chen L. H. et al. 2009).

- The present study showed a vegetable foreign body such as a bean, groundnut or pea as a significant cause for complications due to bronchoscopic extraction (14%) as it often breaks down into multiple pieces during removal and may need several attempts at complete removal. Bronchoscopy on a younger child especially with history of a vegetable foreign body inhalation should not be attempted by a less skilled bronchoscopist/anaesthetist.

- Bronchoscopy should not be unnecessarily prolonged beyond about 20 minutes as it leads to bronchospasm and subglottic oedema and ultimately to complicated patient recovery due to hypoxaemia. The endoscope should be correctly positioned within the bronchus to aeriate the opposite lung. It must be of the proper size with respect to the age of the patient. It may have to be withdrawn to trachea during hypoxia for adequate ventilation before proceeding further, or alternatively may have to be withdrawn fully and the patient intubated and ventilated before the next attempt at bronchoscopy.

- Foreign bodies can be removed from the airway with speed and safety with telescopic optical forceps passed through the ventilating bronchoscope as these provide good visual control in locating the foreign body and its extraction.

- Falling oxygen saturation during or in the post operative period should be seriously taken notice of and managed effectively. Close co-operation between the endoscopist and the anaesthetist is mandatory. Similarly, other complications associated with bronchoscopy such as laryngospasm, pneumothorax and
pneumonitis should be recognised and treated early enough.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References


Comparison of Coblation Tonsillectomy vs Dissection Tonsillectomy

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Abstract

Background: Tonsillectomy is one of the most commonly performed surgical operations in the recent years. It is mainly done for chronic tonsillitis and obstructive symptoms. Aims & Objectives: To compare the operating time, intraoperative blood loss, postoperative pain, time needed to return to normal diet and activity in coblation and dissection tonsillectomy. Methods: This is a prospective study done at Pushpagiri Medical College for a period of one and a half years from March 2015 to September 2016. Out of the 50 patients, 25 underwent coblation tonsillectomy and 25 underwent conventional dissection tonsillectomy. Method of surgery depended on patients’ or parents’ choice. Intra operative measures like operating time, blood loss and post-operative morbidity were measured and compared. Results: In this study, there was significant difference in intraoperative time in coblation tonsillectomy compared to cold dissection tonsillectomy (mean operative time—13.4 minutes for coblation and 20.4 minutes for cold dissection with p value less than 0.05). Intraoperative blood loss was significantly less for coblation (18.9 ml) compared to traditional (43.0 ml) with p value 0.002. Average postoperative pain score 6 hours after operation was 7.6 for coblation and 8.5 for cold dissection with a significant p value of 0.002. Average time taken to return to normal diet among coblation was 6.4 days and dissection was 7.0 days with p value of 0.078 which is not statistically significant. However, average time taken to return to normal activity among coblation was 6.3 days and dissection was 7.1 days with a significant p value of 0.024. Conclusion: Coblation tonsillectomy significantly reduces the operation time, intraoperative blood loss, immediate postoperative pain, and patient returns early to regular routine, but with a higher cost.

Keywords

Tonsillectomy, Cold Dissection, Coblation, Operation Time, Postoperative Pain
1. Introduction

Palatine tonsils are collection of lymphoid tissue situated in oropharynx within tonsillar fossa. Tonsils are important in children because of its role in immunology and defense mechanism. Antibody secretion, especially secretory IgA production, plays an important role in mucosal defense mechanism. For unknown etiology, their protective mechanism sometime fails and becomes seat of infection causing sore throat, fever and other complications. This requires removal of the diseased tonsils.

Tonsillectomy is one of the most commonly performed surgical operations in the recent years. It is mainly done for chronic tonsillitis and obstructive sleep apnea (OSA). Standard or extracapsular tonsillectomy, which is typically performed under general anesthesia involves surgically removing the palatine tonsil and capsule, and then sealing blood vessels (hemostasis) with ligatures (ties), sutures, or heat (diathermy) [1]. There are various methods described in literature for tonsillectomy which includes dissection, guillotine, cryosurgery, monopolar and bipolar diathermy dissection, thermal welding, ultrasonic removal, radiofrequency surgery and laser surgery [2]-[10]. But the superiority of one over another has not been clearly demonstrated. For recurrent acute tonsillitis, it has been reported that watchful waiting results in a higher cost compared to tonsillectomy.

As regard to the different surgical techniques, improving the intra-operative efficiency and reducing post-operative morbidity are the most important parameters in assessing the best method in this procedure. The most common side effects of tonsillectomy are pain and post-operative bleeding, but patients may also experience difficulty in swallowing, nausea, vomiting, throat and ear pain, weight loss, dehydration, fever and airway obstruction.

On comparing coblation tonsillectomy and cold dissection tonsillectomy, many studies have been done with the above-mentioned parameters. Cold dissection tonsillectomy is done with cold steel instruments and hemostasis is obtained with either ligation technique or by using electrocautery. Coblation tonsillectomy means tonsillectomy done with coblation assisted procedure using Arthro Care Evac 70 Arthro Wand [11] (Arthro Care Corp., Sunnyvale, CA) handpiece. It can be used for subcapsular, intracapsular or extracapsular dissection. Coblation process involves passing a bipolar radiofrequency current through isotonic saline to convert it into an ionized plasma layer. This layer effectively disrupts intercellular molecular bonds in the tissues resulting in a vaporization effect. Surface irrigation and suction are applied to prevent significant pooling of saline inside the oral cavity. Coblation generates a substantially lower thermal effect compared to electrocautery, estimated between 45˚C - 85˚C, with a subsequent presumption of diminished collateral thermal damage to surrounding tissues [11].

The temperature reaches up to 40˚C - 70˚C in Coblation while in electrocautery, which is used in conventional cold dissection tonsillectomy it reaches up to
400°C - 600°C. The thermal penetration is minimal with Coblation, but it is usually very deep with electrocautery. The target tissue undergoes dissolution in Coblation, but there is rapid heating, charring, burning & cutting of target tissue with electrocautery. Finally, surrounding tissues are not much affected with Coblation. They undergo minimal dissolution. But with electrocautery there is inadvertent charring/burning of surrounding tissue [12].

Objectives

To compare the operating time, intra operative blood loss, postoperative pain, time needed to return to normal diet and activity in coblation and dissection tonsillectomy.

2. Materials and Methods

2.1. Type of Study and Source of Data

A prospective study was conducted for a period of one and a half years from March 2015 to September 2016 to compare the operation time, intraoperative blood loss, postoperative pain, time needed to regain the normal diet and activity in coblation and dissection type of tonsillectomy from the patients undergoing tonsillectomy in ENT department of Pushpagiri Institute of Medical Sciences & Research Centre, Thiruvalla, Kerala.

2.2. Inclusion Criteria

1) Chronic tonsillitis-7 or more episodes/year or 5 or more episodes/year for 2 years or 3 or more episodes/year for 3 years.
2) Obstructive symptoms related to tonsil hypertrophy.
3) Patients of both sex between the age group 5 to 45 years come under the study.

2.3. Exclusion Criteria

1) Age less than 5 year and more than 45 year.
2) Patients with a history of a bleeding disorder.
3) History of tonsillitis within three weeks prior to surgery.

2.4. Method of Data Collection

The patients were selected consecutively as and when they were presented during the study period of one and a half years from March 2015 to September 2016 in ENT department of Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, Kerala, considering the inclusion and exclusion criteria. This study involved 50 patients out of whom 25 underwent coblation tonsillectomy and the rest 25 underwent conventional cold steel tonsillectomy. The patients were free to choose the procedure. A complete history, ENT examination and appropriate investigations were done to arrive at the correct diagnosis.

During admission day, all patients and parents were taught how to fill the
post-operative pain score form. Pre-operatively, single dose of Amoxicillin-Clavulanic acid injection was given for all the patients. Operations were done using a standard technique of either cold dissection tonsillectomy or coblation tonsillectomy. Surgery was done under general anesthesia. The patient was put in Rose position and adequate exposure of Oropharynx was obtained by Boyle Davis mouth gag.

Surgical time was measured from the insertion of Boyle-Davis mouth gag to the final hemostasis and removal of mouth gag. Time taken was recorded in minutes. Intraoperative blood loss was measured by weighing the tonsil swab before and after tonsillectomy and by measuring the amount in the suction bottle in dissection tonsillectomy. For coblation tonsillectomy, blood loss was calculated by deducting the total amount of blood in suction jar with estimated saline used for the surgery.

Postoperative outcomes were obtained via answers to a survey administered to the patient or caregiver. This included a combination of the Wong-Baker FACES pain scale and a set of questions—adapted from questionnaires as detailed by Chang and Myatt (Table 1)—in order to evaluate patients, return to normal diet and activity, pain level. In addition, caregivers were also asked how their daily activity was being affected by their child’s recovery course. The caregivers or patient had to fill identical copies of this survey on POD 0, 1, 3, 5 and 7 [13].

### Table 1. Patient evaluation questionnaire.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>A. Not at all</th>
<th>B. Sips reluctantly when encouraged</th>
<th>C. Sips on their own</th>
<th>D. Drinking as usual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Have you or your child been drinking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Have you or your child been eating?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) What kind of foods have you or your child been eating?</td>
<td>A. Has not been eating</td>
<td>B. Juices and fluids</td>
<td>C. Soft foods</td>
<td>D. Regular diet</td>
</tr>
<tr>
<td>4) Have you or your child been talking?</td>
<td>A. Not at all</td>
<td>B. A few words quietly</td>
<td>C. In a normal voice but less talkative than usual</td>
<td>D. Talking as usual</td>
</tr>
<tr>
<td>5) Have you or your child been active?</td>
<td>A. No, lying in bed</td>
<td>B. Reluctant to sit up in bed</td>
<td>C. Sitting up in bed</td>
<td>D. Getting out of bed</td>
</tr>
<tr>
<td>6) Has your child been playing?</td>
<td>A. Not at all</td>
<td>B. Playing in bed</td>
<td>C. Getting up to watch others</td>
<td>D. Getting up to play</td>
</tr>
<tr>
<td>7) How have you or your child’s mood been?</td>
<td>A. Silent</td>
<td>B. Unhappy and miserable</td>
<td>C. A little upset</td>
<td>D. Content, cheerful</td>
</tr>
<tr>
<td>8) Did your child have to miss school/daycare today?</td>
<td>A. Yes</td>
<td>B. No</td>
<td>C. Does not attend school/daycare</td>
<td></td>
</tr>
<tr>
<td>9) Did you have to miss work today?</td>
<td>A. Yes</td>
<td>B. No</td>
<td>C. Would not have worked anyway</td>
<td></td>
</tr>
<tr>
<td>10) Were you able to complete all of your planned activities and errands for today?</td>
<td>A. Yes</td>
<td>B. Some of them</td>
<td>C. No</td>
<td></td>
</tr>
</tbody>
</table>
2.5. Postoperative Care

Postoperatively all patients treated with antibiotic (Amoxicillin Clavulanicacid) with doses based on body weight, pain medication (paracetamol), with doses based on body weight and povidone iodine gargle and all of them were discharged at post op day 1. Patients were given verbal as well as written instructions regarding medication at home and guidance regarding food intake and general care. All patients were followed up for 7 days after surgery. Patients were all seen in the outpatient department on the 7th postoperative day and examination of their throat was carried out with a subjective measure about the area of the tonsillar fossa that was healed or covered in slough and the questionnaire form were collected.

2.6. Statistical Analysis

The results were compared by paired t-test and Chi-square test and the p-value was calculated. All p-values below 0.05 were considered statistically significant.

3. Result

All 50 patients were available for regular post-operative follow-up. A total of 50 cases underwent tonsillectomy out of whom 25 underwent coblation tonsillectomy while the rest underwent conventional cold steel tonsillectomy from March 2015 to September 2016 in ENT department of Pushpagiri Institute of Medical Sciences and Research Centre. All the patients were available for regular post-operative follow up.

The data were analyzed.

3.1. Operation Time

Table 2 and Table 3 show intraoperative time for both of the procedures. In our study, the intraoperative time for coblation tonsillectomy ranged from 4 to 30 minutes with an average of 13.4 (±7.0) minutes while it took about 5 to 40 minutes to complete cold dissection tonsillectomy with an average of 20.4 (±9.7) minutes. Paired T test showed a significant p value of 0.005.

3.2. Intraoperative Blood Loss

Table 4 and Table 5 show intraoperative estimated blood loss for the procedures. The average blood loss in coblation tonsillectomy ranged from 4 to 66 ml.

Table 2. Descriptive statistics for operation time based on method.

<table>
<thead>
<tr>
<th>Descriptive statistics</th>
<th>Coblation</th>
<th>Dissection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>13.4</td>
<td>20.4</td>
</tr>
<tr>
<td>SD</td>
<td>7.0</td>
<td>9.7</td>
</tr>
<tr>
<td>Median</td>
<td>12.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Minimum</td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>30.0</td>
<td>40.0</td>
</tr>
</tbody>
</table>
Table 3. Comparison of operation time based on method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>( t )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coblation</td>
<td>13.4</td>
<td>7.0</td>
<td>25</td>
<td>2.93**</td>
<td>0.005</td>
</tr>
<tr>
<td>Dissection</td>
<td>20.4</td>
<td>9.7</td>
<td>25</td>
<td></td>
<td></td>
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</tbody>
</table>

Paired t test significant when \( p \) value less than 0.05.

Table 4. Descriptive statistics for blood loss based on method.

<table>
<thead>
<tr>
<th></th>
<th>Coblation</th>
<th>Dissection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>18.9</td>
<td>43.0</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>15.0</td>
<td>33.1</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>15.0</td>
<td>30.0</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>4.0</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>66.0</td>
<td>140.0</td>
</tr>
</tbody>
</table>

Table 5. Comparison of blood loss based on method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>( t )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coblation</td>
<td>18.9</td>
<td>15.0</td>
<td>25</td>
<td>3.32**</td>
<td>0.002</td>
</tr>
<tr>
<td>Dissection</td>
<td>43.0</td>
<td>33.1</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Paired t test significant when \( p \) value less than 0.05.

with an average of 18.9 (±15.0) ml while it was 8 to 140 ml with an average of 43.0 (±33.1) ml in cold dissection tonsillectomy. Again, paired T test showed a significant \( p \) value of 0.002.

3.3. Post-Operative Pain

Table 6 compares post-operative pain scores among coblation tonsillectomy versus dissection tonsillectomy. Average pain score 6 hours after operation was 7.6 for coblation and 8.5 for cold dissection with a significant \( p \) value of 0.002. In postoperative day 5, pain score average was 2.8 for coblation and 3.9 for cold dissection with a significant \( p \) value of 0.003. Thus, there was significantly less pain in coblation six hours and 5 days after the operation. However, there were no differences of pain severity between the two methods at day 1, 3 and 7 post-operative.

3.4. Time to Return to Normal Diet

Table 7 compares time to return to normal diet among coblation tonsillectomy versus dissection tonsillectomy. Average time taken to return to normal diet among coblation was 6.4 days and dissection was 7.0 days with \( p \) value of 0.078 which is not statistically significant.

3.5. Time to Return to Normal Activity

Graph 1 compares time to return to normal activity among coblation tonsillectomy versus dissection tonsillectomy. Average time taken to return to normal
Table 6. Comparison of post-operative pain based on method.

<table>
<thead>
<tr>
<th>Pain</th>
<th>Coblation</th>
<th>Dissection</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Median</td>
<td>Mean</td>
</tr>
<tr>
<td>6 hours</td>
<td>7.6</td>
<td>0.8</td>
<td>8</td>
<td>8.5</td>
</tr>
<tr>
<td>Day 1</td>
<td>7.5</td>
<td>1.0</td>
<td>8</td>
<td>7.9</td>
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<tr>
<td>Day 3</td>
<td>5.3</td>
<td>1.0</td>
<td>6</td>
<td>5.9</td>
</tr>
<tr>
<td>Day 5</td>
<td>2.8</td>
<td>1.2</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>Day 7</td>
<td>0.7</td>
<td>1.1</td>
<td>0</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Paired t test significant when p value less than 0.05.

Table 7. Comparison of time to return to normal diet based on group.

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coblation</td>
<td>6.4</td>
<td>1.0</td>
<td>25</td>
<td>1.8</td>
<td>0.078</td>
</tr>
<tr>
<td>Dissection</td>
<td>7.0</td>
<td>1.4</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Paired t test significant when p value less than 0.05.

activity among coblation was 6.3 days and dissection was 7.1 days with a significant p value of 0.024.

3.6. Summary of Results

Table 8 shows the summary of results of coblation tonsillectomy, whereas Table 9 shows the results of dissection tonsillectomy.

4. Discussion

Tonsillectomy is one of the most common operations performed in ENT worldwide. Several investigators have explored alternative methods with novel surgical instrumentation and techniques to maintain intraoperative surgical advantages without sacrificing the patients’ postoperative recovery. Tonsillectomy with cold steel forceps (as traditional) consumes longer time than coblation tonsillectomy [14].
### Table 8. Coblation tonsillectomy.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Age</th>
<th>Sex</th>
<th>Hospital number</th>
<th>Blood loss (in ml)</th>
<th>Operation time (in min)</th>
<th>Normal diet (in days)</th>
<th>Normal activity (in days)</th>
<th>Pain 6 hour</th>
<th>Pain pod 1</th>
<th>Pain pod 3</th>
<th>Pain pod 5</th>
<th>Pain pod 7</th>
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<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>M</td>
<td>482,575</td>
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### Table 9. Dissection tonsillectomy.

<table>
<thead>
<tr>
<th>S No</th>
<th>Age</th>
<th>Sex</th>
<th>Hospital number</th>
<th>Blood loss (in ml)</th>
<th>Operation time (in min)</th>
<th>Normal diet (in days)</th>
<th>Normal activity (in days)</th>
<th>Pain 6 hour</th>
<th>Pain pod 1</th>
<th>Pain pod 3</th>
<th>Pain pod 5</th>
<th>Pain pod 7</th>
</tr>
</thead>
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<td>25</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
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<td>560,225</td>
<td>60</td>
<td>25</td>
<td>6</td>
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<td>29</td>
<td>F</td>
<td>499,575</td>
<td>80</td>
<td>40</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>29</td>
<td>F</td>
<td>505,172</td>
<td>40</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<td>6</td>
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</tr>
<tr>
<td>6</td>
<td>8</td>
<td>F</td>
<td>503,837</td>
<td>60</td>
<td>40</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>
The surgical technique of coblation tonsillectomy is based on dissection of the tonsil in the relatively bloodless tonsillar muscular plane, using an Arthro Care Evac 70 Arthro Wand (Arthro Care Corp., Sunnyvale, CA). The operating principle of coblation and bipolar diathermy or electrosurgery is similar. In both, an alternative current passing between the active electrodes in the tip of the device produces destruction of the target tissue adjacent to the electrodes. In bipolar diathermy, direct contact between electrodes and tissue produces local temperatures of 400°C to 600°C resulting in heating of intracellular contents and subsequent vaporization of the cell. But coblation fills the physical space between the electrodes with a medium rich in sodium (e.g., isotonic saline). By coblation the medium is dissociated into free sodium ions, which will disrupt the intercellular bonds, resulting in tissue dissociation. This is achieved at temperatures between 60°C to 70°C with minimal collateral thermal tissue damage. And, the presence of cool, irrigating isotonic saline helps to limit the amount of heat delivered to the surrounding structures and a clear surgical field [15] [16].

In this study we compared two techniques of tonsillectomy, the coblation and traditional cold dissection in terms of intraoperative efficiency and post-operative morbidity. With these measures, this study could have an overview which method is better comparatively.

In our study, the patients’ age ranged from 5 years to 45 years old with mean
of 18.3 years old in coblation and mean of 19.1 in dissection type. There was no significant difference between the mean age of two groups (p > 0.05), being 18.3 years in coblation and 19.1 years in traditional group which means that study groups are comparable. This study design is similar to that of Omrani et al. [17]. Paediatric age group (5 - 12 years old) were 11 for coblation and 10 for cold dissection type, adolescent (13 - 18 years old) were 3 for coblation and 6 for cold dissection type and adult (19 years old and above) were 11 for coblation and 10 for cold dissection type. Divided in age group, number of patients was almost equivalent in pediatric and adult group while adolescent accounted a smaller number of cases. Here the study showed that incidence of tonsillectomy may vary according to age group. A similar finding regarding age distribution was also noted in a study by Vestergard et al. [18].

The main objectives of this study were to evaluate the intraoperative efficiency and post-operative morbidity and the result showed that there was statistically significant difference in intraoperative time in coblation tonsillectomy comparing with cold dissection tonsillectomy (mean operative time is 13.4 for coblation and 20.4 for cold dissection with p value less than 0.05). In our study intraoperative blood loss was significantly less for coblation (18.9 ml) compared to traditional (43.0 ml) with p value 0.002.

Coblation instrumentation uses a bipolar radio frequency waves that are transmitted by conductive solution (i.e. isotonic) between the device and the target tissue. Here same instrument is ablating the target tissue and also coagulating bleeding point during the procedure, thus reducing the time and blood loss compared to cold dissection where usually surgeon had to dissect the tonsils first before using any hemostasis techniques such as ligation or electrocautery diathermy.

In our study, average postoperative pain score 6 hours after operation was 7.6 for coblation and 8.5 for cold dissection with a significant p value of 0.002. In post-operative day 5, pain score average was 2.8 for coblation and 3.9 for cold dissection with a significant p value of 0.003. Thus, there is significantly less pain in coblation six hours and 5 days after the operation. However, there were no differences of pain severity between the two methods at day 1, 3 and 7 postoperative. Generally, in comparing the overall post-operative pain score between coblation and cold dissection tonsillectomy, there was no significant difference between coblation and cold dissection side (p value 0.1). This may be due to a small sample size. However, based on pain score on a daily basis there was statistical difference in post-operative pain score during 6 hours and 5 days post-operative. From the above result, it looks like patient did benefit in having less pain in coblation in immediate post-operative period and day 5 compared to cold dissection. In the following days post operatively (day 1, 3 and 7); there was slight difference in pain score which was not statistically significant, but in favor of coblation. This also showed that post-operative pain score in coblation tonsillectomy still superior and not inferior to cold dissection tonsillectomy.
In our study, there is no post-operative hemorrhage in both groups, which confirmed that there was no relative increase in postoperative hemorrhage in coblation compared to traditional method which is similar to the studies conducted by Divi et al. and Glade et al. [19] [20].

In our study, average time taken to return to normal diet among coblation was 6.4 days and dissection was 7.0 days with p value of 0.078 which was not statistically significant. However, time to return to normal activity, average time taken to return to normal activity among coblation was 6.3 days and dissection was 7.1 days with a significant p value of 0.024.

Compared to cold dissection, the most significant disadvantages of coblation were a learning curve, although it was relatively short, and the expense of the wand. Costs of coblation tonsillectomy include a wand for each patient or maximum up to 2 - 3 patients; further use will affect the favorable intra and post-operative outcome of surgery. In addition, this tool is substantially costlier than that used to perform cold dissection.

Funding
None.

Conflicts of Interest
None declared.

Ethical Approval
Not required.

Limitation of the Study
The sample size is small. A larger sample size and randomization would have improved the value of our study a little bit more.

References


Histological Profile of ENT and Cervico-Facial Lesions in Mali

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Abstract

Aim: Our goal was to determine the histological profile of ENT lesions. Method: We carried out a retrospective and descriptive study in the ENT department and Cervico-Facial Surgery at the university hospital center Gabriel Touré (MALI) from 1995 to 2014. It made it possible to collect 450 cases. Result: We found a male predominance; 51.11% or a sex ratio of 1.04. The mean age of patients was 38.04 years with a standard deviation of 19.49 years and extremes of 3 months and 91 years. Benign tumors were the most frequent (154 cases or 34.22%) including 75 cases of adenomas and 43 cases of papillomas. Cancers accounted for 48.11% (or 153 cases) of all tumors and 34% of lesions. Carcinomas accounted for 81.04%, malignant lymphomas 13.72% and sarcomas 5.22% of cases. Among the 140 cases (31.11%) of inflammatory pseudotumors, we found 12 cases of tuberculosis and 15 cases of rhinoscleroma. Three (3) cases of dysplasia were observed. Conclusion: Interest should be focused on histology in order to initiate appropriate therapy.

Keywords

ENT Lesions, Histology, Mali

1. Introduction

Otorhinolaryngology (ENT) disorders are one of the main reasons for consultation in General Medicine and Pediatrics [1]. Given the diversity of the causes mentioned and the complexity of the lesions, the practitioner must resort to pa-
raclinical examinations. Histological examination is essential because it allows an accurate diagnosis of most lesions [2] for appropriate treatment [3]. The head and neck tumoral pathology includes benign tumors, cancers and inflammatory pseudo-tumors [2]. Benign tumors respond to surgery in general. As for cancers of the head and neck region, they affect about 40,000 patients/year in the USA [4] and rank fourth among human cancers, 10% of cancers in France, with an incidence of 16,000 new cases and a death toll of 5406 (5th leading cause of death in humans) in 2005 [5]. Studies reporting ENT histological lesions globally are rare [6] in Mali, most often focusing on specificities [7] [8].

Our goal was to determine the histological profile of ENT lesions.

2. Materials and Method

This is a retrospective and descriptive study of ENT and Cervico-facial lesions, histologically examined, collected in the ENT department and cervico-facial surgery of the Gabriel Toure University Hospital Center from 1995 to 2014. The study focused on patients with upper airborne (VADS) or cervicofacial lesions that were subjected to tissue sampling in consultation, hospitalization, or the operating room for pathological examination. The fixation was carried out with formalin on the spot, then the samples sent to the laboratory of Pathological Anatomy in vials.

450 patients were selected with a precise histological diagnosis and a precise localization of the lesion in the period indicated above. Patients who did not receive pathological examination, or a doubtful diagnosis, or those with two or more discordant results, unspecified anatomical site, poorly performed specimens and lesions whose date of diagnosis did not correspond to the period indicated above have been excluded.

We carried out a systematic examination of the anatomopathological results of the patients. The data was entered on Excel 2013 and the analysis was done on SPSS 20.0. The statistical test is used with Chi2 with P < 0.05.

The variables concerned sociodemographic data, the anatomical site of the lesion, the benign or malignant nature and the histological type.

3. Results

3.1. Socio-Demographic Aspect

Over 20 years, we collected 450 cases. The male sex (Table 1) accounted for 51.11% with a sex ratio of 1.04. The average age was 38.04 years with a standard deviation of 19.49 years and extremes of 3 months to 91 years. The age group 30 - 39 years was the most represented with 17.33%.

3.2. Topographic Appearance

The nasolabial lesion site accounted for 26% followed by larynx with 21.33% (Table 2).
### Table 1. Distribution by age and sex.

<table>
<thead>
<tr>
<th>Age class (year)</th>
<th>Sex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>0 - 9</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>10 - 19</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>20 - 29</td>
<td>22</td>
<td>41</td>
</tr>
<tr>
<td>30 - 39</td>
<td>35</td>
<td>43</td>
</tr>
<tr>
<td>40 - 49</td>
<td>32</td>
<td>27</td>
</tr>
<tr>
<td>50 - 59</td>
<td>39</td>
<td>31</td>
</tr>
<tr>
<td>60 - 69</td>
<td>32</td>
<td>19</td>
</tr>
<tr>
<td>70 and over</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>230</strong></td>
<td><strong>220</strong></td>
</tr>
</tbody>
</table>

### Table 2. Breakdown by lesion topography (Headquarters).

<table>
<thead>
<tr>
<th>Seat</th>
<th>Effective</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larynx</td>
<td>96</td>
<td>21.33</td>
<td>21.33</td>
</tr>
<tr>
<td>Hypopharynx</td>
<td>12</td>
<td>2.67</td>
<td>24.00</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>19</td>
<td>4.22</td>
<td>28.22</td>
</tr>
<tr>
<td>Cavum</td>
<td>9</td>
<td>2.00</td>
<td>30.22</td>
</tr>
<tr>
<td>Oral cavity</td>
<td>34</td>
<td>7.56</td>
<td>37.78</td>
</tr>
<tr>
<td>Nose and sinus</td>
<td>117</td>
<td>26.00</td>
<td>63.78</td>
</tr>
<tr>
<td>Salivary glands</td>
<td>33</td>
<td>7.33</td>
<td>71.11</td>
</tr>
<tr>
<td>Thyroid</td>
<td>52</td>
<td>11.56</td>
<td>82.67</td>
</tr>
<tr>
<td>Hear</td>
<td>16</td>
<td>3.56</td>
<td>86.22</td>
</tr>
<tr>
<td>Ganglion</td>
<td>42</td>
<td>9.33</td>
<td>95.56</td>
</tr>
<tr>
<td>Esophagus</td>
<td>7</td>
<td>1.56</td>
<td>97.11</td>
</tr>
<tr>
<td>Trachea</td>
<td>1</td>
<td>0.22</td>
<td>97.33</td>
</tr>
<tr>
<td>Bronchi</td>
<td>1</td>
<td>0.22</td>
<td>97.56</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>2.44</td>
<td>100.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>450</strong></td>
<td><strong>100.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Other: Temporal region, Back-to-auricular region, Sub mental region, Supraorbital region, Frontal region, Upper maxillary.*

### 3.3. Histological Profile

#### 3.3.1. Benign Tumor

The histological result revealed a predominance of benign tumor with 154 cases (34.22%) ([Table 3](#)). A predominance of these lesions was observed in the thyroid with 41 cases (9.11% of all ENT and cervicofacial lesions and 26.62% of benign tumors); followed by nose and sinuses (31 cases or 20.12% of benign tumors).
Table 3. Distribution according to the result of histological examination.

<table>
<thead>
<tr>
<th>Histology</th>
<th>Effective</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Malignant neoplasms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>carcinoma</td>
<td>124</td>
<td>27.55%</td>
</tr>
<tr>
<td>lymphoma</td>
<td>21</td>
<td>4.66%</td>
</tr>
<tr>
<td>Sarcoma</td>
<td>8</td>
<td>1.77%</td>
</tr>
<tr>
<td>adenoma</td>
<td>75</td>
<td>16.66%</td>
</tr>
<tr>
<td>fibroma</td>
<td>9</td>
<td>2%</td>
</tr>
<tr>
<td>birthmark</td>
<td>13</td>
<td>2.88%</td>
</tr>
<tr>
<td>neuroangiome</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>Papilloma</td>
<td>43</td>
<td>9.55%</td>
</tr>
<tr>
<td>chondroma</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td><strong>Benign tumors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>osteoma</td>
<td>2</td>
<td>0.44%</td>
</tr>
<tr>
<td>Lipoma</td>
<td>3</td>
<td>0.66%</td>
</tr>
<tr>
<td>menigioma</td>
<td>2</td>
<td>0.44%</td>
</tr>
<tr>
<td>Lipomyxome</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>histiocytoma</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>benign ulcer</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>sinus histiocytosis</td>
<td>2</td>
<td>0.44%</td>
</tr>
<tr>
<td>inflammatory polyp</td>
<td>23</td>
<td>5.11%</td>
</tr>
<tr>
<td>Benign cyst</td>
<td>11</td>
<td>2.44%</td>
</tr>
<tr>
<td>non specific chronic inflamations</td>
<td>58</td>
<td>12.88%</td>
</tr>
<tr>
<td>trichinelliosis</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>tuberculosis</td>
<td>12</td>
<td>2.66%</td>
</tr>
<tr>
<td><strong>Inflammatory pseudo-tumors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sclérome</td>
<td>15</td>
<td>3.33%</td>
</tr>
<tr>
<td>glandular hamartoma</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>pyogenic granuloma</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td>hyperplasia</td>
<td>4</td>
<td>0.88%</td>
</tr>
<tr>
<td>thyroiditis</td>
<td>3</td>
<td>0.66%</td>
</tr>
<tr>
<td>chronic laryngitis</td>
<td>10</td>
<td>2.22%</td>
</tr>
<tr>
<td>acute granuloma</td>
<td>1</td>
<td>0.22%</td>
</tr>
<tr>
<td><strong>Dysplasia</strong></td>
<td>3</td>
<td>0.66%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td>100%</td>
</tr>
</tbody>
</table>

Benign neoplasms vs. Malignant: Pr (|Z| > |z|) = 0.9676. Benign neoplasms vs. Inflammatory pseudo-tumors: Pr (|Z| > |z|) = 0.5981. Malignant neoplasms vs. Inflammatory pseudo-tumors: Pr (|Z| > |z|) = 0.5703. Malignant neoplasms vs. dysplasia: Pr (|Z| > |z|) = 0.3161. Benign neoplasms vs. dysplasia: Pr (|Z| > |z|) = 0.3193.

Among benign tumors adenomas are the most common with 75 cases (i.e. 16.67% of all ENT and cervico-facial lesions or 48.70% of benign tumors or 24.42% of all true tumors of our series). There is a female predominance of benign tumors with a sex ratio of 0.61.
They are observed at all ages with a higher frequency in the age group 10 - 29 years (50 cases or 32.46% of benign tumors). After the adenomas come papillomas with 43 cases (i.e. 27.92% of benign tumors and 9.55% of all ENT lesions).

3.3.2. Malignant Neoplasm

We found 153 cases (34%) of malignant tumors including 124 cases of all types of carcinoma (representing 27.56% of all ENT and cervicofacial lesions or 40.39% of the cases of tumors observed or 81.04 % of cancers). A predominance of these malignant lesions was found in the larynx with 45 cases (i.e. 10% of all ENT lesions or 29.41% of cancers or 14.65% of true tumors); followed by nose and sinuses (30 cases, i.e. 19.60% of cancers or 9.77% of true tumors or 6.66% of all lesions). A male predominance of these cancers was observed with a sex ratio of 2.19. They were seen at all ages with a higher frequency in the age group 50 - 59 years with 31 cases (20.26%).

• Squamous cell carcinoma
  Squamous cell carcinoma accounted for 67.32% (103 cases) of all cancers, 83.06% of carcinomas and 22.88% of all lesions. In 72.72%, this was a male subject.

• Lymphoma
  Lymphomas were seen almost at all ages 0 to 70 years with a frequency of 4.67% (21 cases) on all lesions and 13.72% of cancers, Its frequency among the under 40s was 71.42% (15 cases). A male predominance with a sex ratio of 2.16 was noted. The most common site was the ganglion with 9 cases, 42.85%, followed by palatine tonsils and nasosinus cavities, each with 5 cases (23.80%). We also observed it at the level of the tongue and in the cavum with one case each.

• Sarcomas
  Sarcomas (Mixoid sarcoma, Osteosarcoma, Angiosarcoma, Kaposi’s sarcoma, Embryonic rhabdomyosarcoma, Liposarcoma) were recorded, 8 cases (1.78% of all lesions and 5.22% of cancers). They were children and adults. The sex ratio is 1.66. The most frequent site was the nasal cavity (4 cases, or 50%) followed by the larynx (2 cases, 25%). We have also observed it in the ganglion and in the temporal region.

3.3.3. Inflammatory Pseudo-Tumors

Inflammatory pseudo-tumors were represented by 140 cases (31.11%). It was about:

• Specific chronic infections
  We noted 27 cases (19.28% of pseudo-tumors and 6% of all ENT lesions). They were represented by 12 cases of tuberculosis (2.66% of all ENT lesions) and 15 cases of Rhinoscleroma (3.33% of all ENT lesions).

• Inflammatory polyp
  Represented by 23 cases (16.42% of the pseudo-tumors) of which 19 were in the naso-sinus cavities.


- **Non-specific chronic inflammations**

  Represented by 58 cases or 41.42% of pseudo-tumors. These pseudo-tumors were seen at all ages and a sex ratio of 0.92. We found a predominance of these inflammatory pseudo-tumors in the naso-sinus cavities with 53 cases (41.08%).

3.3.4. Dysplasia

We observed three cases distributed respectively between the larynx, the amygdala and at the level of the nasal vestibule. They were all severe and the subjects were men with an age of 6; 50 and 26 years old.

4. Discussion

Histological examination is an essential examination in the management of ENT and cervicofacial disorders. In our context of under medicalization access to these examinations is necessary before the excision of all previously undiagnosed conditions. Their gravity in the ENT sphere housing the sense organs, communication and various anatomical structures from the confines of the brain to the thorax [3] must be an argument guiding any practitioner to perform a biopsy before any suspicious lesions; some of them are often part of neglected tropical diseases [9].

After the standard examination of haematylene eosin (HE) stained sections, considered a prerequisite for diagnosis, the pathologist often uses complementary techniques: (“HC” Histochemistry, “IHC” Immunohistochemistry, “ME” Electron Microscopy Molecular Biology) [2]; which is a limitation of this study, the only service of Anatomie-Pathologie of the country did not have it. Currently some private structures are starting to get some.

The distribution of sex is a function of the histological type. This finding is illustrated by data from the literature [10]. The female predominance of colloidal adenoma in our study is similar to that of the Whickham survey where it is reported that the F/H ratio is 6.6/1 [11]. As for the malignant tumors dominated by squamous cell carcinoma, we are getting closer to the international findings where squamous cell carcinoma of the upper air-digestive tract (VADS) represents the major part of the oncology of the neck and the face [12] [13] [14] [15]. More than 90% of these men are men with a long history of smoking, heavy chronic alcoholism and arduous working conditions [13].

The occurrence of squamous cell carcinoma is poorly distributed in the age groups. We noted its rarity in children (two cases) and a high prevalence in the elderly. The authors reported that the occurrence of carcinomas are rare in the juvenile age, and meet in the fifth and sixth decade of life [13] [14].

Nasosinus lesions accounted for 47.33% (213 cases) and carcinomas were the most common, as in the Tshisau and Kharoubi series, where carcinomas accounted for 50% - 70% of all primary cancers of the nasal cavity [16] [17]. Papilloma was the second most common tumor of naso-sinus tumors after carcinoma.

Nowadays it is described as a rare tumor and accounts for 0.5% to 4% of benign naso-sinus tumors [18]. Rhinoscleroma is a chronic disease caused by an
enterobacterium (*Klebsiella rhinoscleromatis*) that has a remarkable tropism for the upper airways. It is a cosmopolitan disease with high endemic areas in countries with low socio-economic development [19]. The predominance of the female sex and the predilection between 20 and 40 years is the prerogative of rhinoscleroma; we shared the same results [8] [10] [19].

Squamous cell carcinoma accounts for 90% of all laryngeal malignancies [20]. Their incidence is gradually increasing in young adults and women, especially in urban areas. This finding corroborates with our study in which carcinoma constituted 95.55% of laryngeal cancers. The rarity of sarcoma in our study is a report reported by the authors, they are exceptional in the larynx [15].

Laryngeal papillomas are the preserve of children, who can see each other before 10 years of age in two-thirds of cases [21]. This condition accounted for 38.46% in children under 15 years.

Papillary thyroid carcinoma has the reputation of being the most frequent thyroid cancer as in the work of Bouchair [22]. Vesicular, trabecular and anaplastic carcinomas are reported by authors following papillary carcinoma [23] [24] [25], which joins our study.

The prevalence of parotid benign tumors reaches 60% to 74.5% with the pleomorphic adenoma in mind. Benign tumors were the most common in our study. The parotid is the most important gland of the salivation system. All tumor varieties can be seen at any age and regardless of sex [26] [27]. We noted two cases of parotid carcinoma.

The twelve cases of tuberculosis found in our study were distributed unequally. The lymph node involvement was predominant followed by laryngeal and tonsillar involvement. Tuberculosis continues to exist, despite the eradication campaigns, it remains a frequent occurrence in endemic countries [10] [28].

5. Conclusion

Histology is a crucial element in the diagnostic process. Expertise is most often needed to confirm the diagnosis of these often rare, and often unrecognized lesions. This precise diagnosis guarantees a suitable treatment.

Conflicts of Interest

The authors do not declare any conflict of interest.

References


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